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THE
PEN AIR SCHOOL

H. BROUGHTON, B.Sc.

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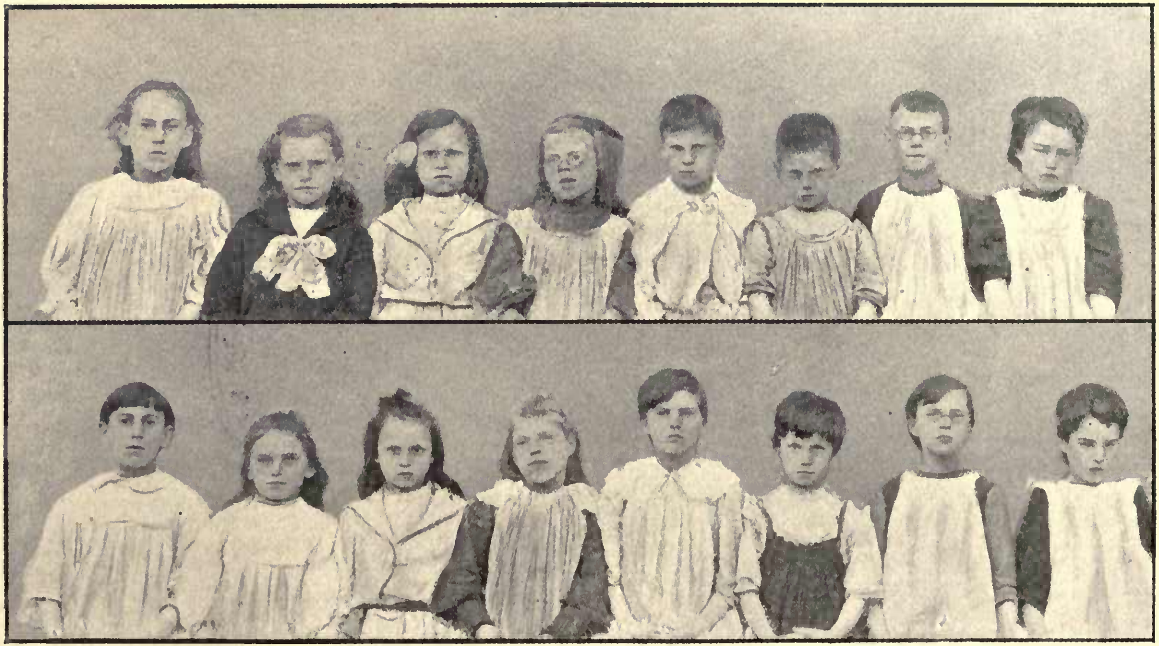
THE
OPEN AIR SCHOOL



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PHOTOGRAPHS OF CHILDREN TAKEN ONE MONTH AND FOUR MONTHS AFTER ADMISSION, SHOWING THE DIFFERENCE IN FACIAL EXPRESSION DUE TO IMPROVED NUTRITION AND ABSENCE OF NERVOUS STRAIN.

THE
OPEN AIR SCHOOL

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BY

HUGH BROUGHTON, B.Sc. (Lond.)

WITH A FOREWORD BY
THE LADY ST. HELIER

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FOREWORD.

BY THE LADY ST. HELIER.

THIS little book contains all that is worth knowing about Open Air Schools, for the author assisted almost from their creation and has taken a large and kindly interest in their success. His knowledge is thoroughly practical and therefore the more valuable.

The work of initiation was not easy: it was a novel experiment, conducted under misgivings as to its success, and most of the knowledge necessary to carry it out successfully had to be acquired by personal experience. And, though the site was in many ways an ideal one, there was no building of any kind on the ground. A large wood on the top of a high hill, with a small field adjoining, presented many problems and possibilities; and, though in bright spring or summer weather such a spot was delightful and, in its way, ideal, there were the endless days and weeks of cold, damp, uncertain weather to contend with—cold and dreary enough to damp the ardour of the greatest optimist.

But the School has gone on growing and flourishing, and has done a wonderful work in the improved health of hundreds of sickly children who, but for its existence, must have succumbed to the many maladies that carry off the underfed and often uncared-for little ones, especially in the early days of their lives. It is a wonderful example of what open air life can achieve. Only those who have seen the puny, undersized, anaemic boys and girls on their entrance into the School, and revisited it after a few months, can realise what Open Air Schools have done and will do in the future

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for the tuberculous children of England. The improvement in their physical condition is marvellous: in a short time their appetities improve and they grow fatter; the good food, the regular hours, and, above all, the enforced rest for a certain time daily, have steadied the heart action; their temperatures have fallen; the distressing symptoms have disappeared; while many children, almost defective, develop, not only physically, but also mentally, to such an extent that they are, after leaving, passed into the elementary schools.

The work of the Open Air School is almost miraculous. The parents are beginning to realise what it means for their children, and there is now a waiting list to fill up the vacancies which occur.

When visiting the Open Air School one is apt to forget what an amount of labour and anxiety has been expended to ensure its success. Only those who are associated with the work can realise the patient devotion, the unceasing care and vigilance, which direct and control, and have enabled it to show such extraordinary results. No words are too emphatic to affirm how much the children's welfare and happiness are due to their teachers, who are rewarded by the consciousness of the good work they are doing, and by the gratitude of many a delicate child that owes its health and future to their care and devotion.

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THE OPEN AIR SCHOOL.

PART I. ORGANIZATION.

CHAPTER I.

The Open Air School Idea.

THE Open Air School is but another instance of history repeating itself. In the days of long ago it was the common practice of the student to go into field and forest, on the hillside, or by the river, to learn what he could either from a teacher or by his own unaided efforts. There were many reasons for this—sometimes it was the only possible means of securing the necessary peace and quietness, sometimes it was because of the old belief that mental development was only possible at the price of the renunciation of friendships and comforts and all else that the world usually holds most dear. Persecution frequently drove teachers and taught into the wilderness, while in other cases schooling was carried on out of doors because it was pleasant, very inexpensive, and all illustrations were ready to hand.

The advance of civilisation was accompanied by a change from outdoor to indoor education—a change very noticeable in the days of the great Greek philosophers—and the method has persisted, in spite of the efforts of reformers of all ages, down to our own times. Those stalwarts who advocated the return to the open air methods included Comenius, Erasmus, Montaigne, Bacon, Locke, Rousseau, Pestalozzi, and Froebel. Let us be content with two quotations which state these opinions very clearly. First, from Comenius—

> As far as possible men are to be taught to become wise, not by books, but by the heavens, the earth, oaks and beeches; that is,

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> they must learn to know and examine the things themselves and not the testimony and observations of others about the things.

Secondly, from Pestalozzi—

> Lead your child out into Nature. Tutor him on the hilltop and in the valleys. There he will listen better, and the sense of freedom will give him more strength to overcome difficulties. But in these hours of freedom let him be taught by Nature rather than by you. Should a bird sing or insect hum on the leaf, at once stop talking. Birds and insects are teaching him; you may be silent.

Such words as these emphasize the truth of the lines suggested by the dandelion to James Russell Lowell.

> Thy wingèd seeds, whereof the winds take care,
>   Are like the words of poet and of sage,
> Which through the free heaven fare,
>   And, now unheeded, in another age
> Take root, and to the gladdened future bear
> That witness which the present would not heed;
> Bringing forth many a thought and deed,
> And, planted safely in the eternal sky,
> Bloom into stars which earth is guided by.

Certainly, little attention was paid to the question of open air teaching till long after the reformers had departed from the scene of their earthly labours. It would be almost true to say that indoor lessons were the invariable rule until the twentieth century. Considerable impetus to the cause has been given by the investigations of Miss MacMillan into the reasons for the unusual preponderance of men and women of University rank who come from the Western Isles and Highlands of Scotland. The explanation is that as children they took such an active part in the pursuits of their parents. They had nothing to eat or wear except what they had taken a share in producing from the materials that Nature provided. Their very life depended upon a real knowledge of Nature, so they became physically fit and mentally practical. Hence, in the schools they soon outstripped their fellows, for they learned rapidly and apparently without effort.

The return to Mother Nature as the fountain-head of learning has resulted in the occasional desertion of the schoolroom for a lesson out of doors, but the establishment of schools where the teaching is entirely under open air conditions owes its origin to quite another cause.

The early years of the present century have seen the doctor enthroned in the schoolroom, and now the doctor and the dominie have to work hand in hand. Briefly it may be said that the Open Air School is the result of a compromise between the educationist and the doctor: the one insisted on intellectual development, the other on curative treatment for certain children; both were satisfied by the establishment of the new type of school.

The early experiments were carried out in Germany, where a thorough system of school medical inspection has been in vogue for nearly twenty years. This inspection soon showed that there was a class of child so backward as to be unfit for the ordinary school, and yet such as could not be classified with the mentally deficient.

Special classes, smaller in size, were arranged for such children, with the object of securing more rapid progress, the idea being that they would again overtake those scholars who had previously beaten them, and consequently could be passed back again into the ordinary class.

Sometimes this hope was realised, but closer observation of these backward classes proved that the cause of the trouble in the majority of cases was not really mental but physical. The children were anaemic or suffering from incipient disease—here was the cause of the impaired mental ability! It was obvious that a cure of the disease must precede a normal mental development. It has been estimated that from seven to ten per cent. of all school children may be classed as *backward,* but not *mentally deficient.* The majority of these are backward solely from physical causes, and it is evident that Open Air Schools should at least have accommodation for from three to five per cent. of all our scholars.

Charlottenburg has the honour of being the first town to establish an Open Air Recovery School, a name which has been shortened to, simply, Open Air School. The first experiment was thus made in 1904. A suitable site was chosen in a large pine forest near the town, on an electric car route. A sum, equivalent to about £1,100, was spent on buildings, and £300 on equipment, thus providing accommodation for ninety-five children. These were selected by the school doctor (Dr. Bendix, who, with Dr. Neufert, the Educational Adviser, was the originator of the experiment and was responsible for carrying it to a successful conclusion). Thirty-four children suffered from anaemia, thirty-eight from scrofulous diseases, fourteen from heart disease, and twenty-one from pulmonary disease. In the first season the school was open for only three months, and yet in that short time twenty-five children were completely cured, while forty-eight showed distinct improvement. During the same period the average increase in weight was about half a pound per week per child, while in mental alertness and general cheerfulness there was a marked advance.

It is not surprising that such an experiment was watched with keen interest, and its success awakened much enthusiasm. The authorities at Charlottenburg soon increased the accommodation of the school to two hundred and fifty places, prolonged the period during which the school was open from three months in 1904 to six in 1905, eight in 1906, and, finally, kept it open the whole year round. The example of Charlottenburg was immediately followed by other towns in Germany, with such consistent success that England prepared to follow suit. In 1907 the Royal Arsenal Co-operative Society of Woolwich placed at the disposal of the London County Council a piece of woodland adjoining the Bostal Woods for the purposes of an Open Air School. By the time arrangements could be made the summer was on the wane, and it was not till July 22 that everything was ready—thus only about twelve weeks remained during which the School could be open.

In spite of many mistakes, on the whole the venture was regarded as a distinct success, so much so that in the following year (1908), three such schools were opened in London. Quickly the movement spread to the provinces—Bradford, Sheffield, Halifax, Birmingham, Bristol, Barnsley, Norwich, Kettering, Manchester, Liverpool, each having its own Open Air School; indeed, one can safely say that in a few years this type of school will form an important part of the educational system in all great centres of population. In addition to the above list of day Open Air Schools, there are residential Open Air Schools at Halifax and Clacton-on-Sea.

From the beginning the Board of Education has been very sympathetic, no hard and fast rules have been laid down, and approval has been shown by increased grants. Nor is this to be wondered at, for at length governments are beginning to see that the basis of commercial prosperity is a healthy people. Under the new Insurance Act the Government is paying huge sums for medical treatment for adults in cases of chronic disease—it will be shown later that many forms of incipient disease can be completely cured by a stay of a few months in an Open Air School. The establishment of such schools at the present time will practically dispense with the need of sanatoria twenty-five years hence, besides making a considerable diminution in the number of hospital patients.

One idea that has gained widespread currency is an altogether erroneous one, namely, that the Open Air School provides children with a sort of everlasting picnic; that the time table provides only for eating, sleeping, and playing; that only teachers who are on the verge of breakdown are appointed to the school for the sake of rest and recuperation. Experience shows that for the sake of the children it is wise to emphasize the fact that the Open Air School is above all things a *School*, not a sanatorium or convalescent home. Up to a certain point, the more real work the scholars do, the more do they value the school and the more regular is their attendance. Earnest effort in the mastery of a problem means that ailments are forgotten, and playtime is appreciated and enjoyed to the full—a most potent factor in securing a return to health. Even the ten-year-old child of average intelligence will yearn for the shut-in classroom if he feels that his stronger comrades are leaving him behind in the race for knowledge. Hence it is important that only children who are strong enough for from three to four hours' work per day, should be admitted to the Open Air School. The suitable cases will include the following—

1. Children who suffer simply from that type of malnutrition due to insufficient or improper feeding.
2. Children who are anaemic owing either to living in overcrowded, ill-ventilated rooms, or to overwork or insufficient rest. Many children living in poor neighbourhoods are unable to go to bed until close upon midnight.
3. Children suffering from mild forms of heart disease.
4. Scrofulous children, including those with tuberculous glands, joints, etc.
5. Cases of slight pulmonary disease. Here, great care must be exercised, for more harm than good will be the outcome if phthisis has developed beyond the incipient stage. Moreover, the opinions of doctors vary very much with regard to the possibilities of infection, and for the sake of the other scholars and the peace of mind of their parents it is not advisable to run any risks. It may be stated that in one at least of the German Open Air Schools children suffering from incipient lung and heart diseases are rigidly excluded.
6. Children with nervous disorders (chorea, etc.).
7. Those suffering from adenoids or bronchial catarrh.

In the early years, the head teachers of contributory schools nominated children for the Open Air School and a final selection was made by the Medical Officer. Nowadays, with systematic medical inspection of all children, the task is a much simpler one. In his periodical examination the School Doctor discovers the suitable cases in his district and, subject to the consent of the parents, the children are transferred to the Open Air School as vacancies occur.

In the same manner, as soon as the scholars of the Open Air School are certified as cured they are passed back again to the indoor school. Dr. Auden, the Medical Superintendent of the Birmingham Schools, insists that the Open Air Schools should take none but those cases which will not only show rapid improvement under the treatment but also will sustain the improvement after the return to the ordinary school; thus he infers that some other arrangement should be made for the neglected child of the slum neighbourhood who, shortly after the discharge from an Open Air School as cured, will become ill again. He states three points of importance to serve as a guide in the selection of suitable scholars for the Open Air School.

> 1. That in the selection of cases the character of the home surroundings and the likelihood of an interested and intelligent co-operation of the parents is of prime importance. Without this there is little likelihood of permanent improvement in the health of the children.
>
> 2. That, while the Open Air School is of the greatest possible importance in the treatment of the so-called "pre-tuberculous" cases, when there is actual infection a different curriculum and a much more prolonged course of open air treatment is required than can be given in a non-resident institution.
>
> 3. That there are a certain number of children for whom an open air curriculum is necessary throughout the greater part of their school life if ever they are to be raised into a position of even comparative physical efficiency in after life. I have in previous reports and elsewhere urged the need of some special provision in the ordinary schools, and need not again reiterate the arguments for open air classrooms and sanatoria classes.

As further arguments in favour of the Open Air School, we may say that for the year ended July 31, 1912, the Board of Education paid a special grant under Part II of the Medical Treatment Grant Regulations towards the maintenance of children in Open Air Schools. The grant was at the rate of £3 per head, and it must be remembered that this is on top of the ordinary grants under the Blind, Deaf, Defective, and Epileptic Acts for Residential and Day Schools respectively.

Moreover, it must be remembered that a child absent from school, for any cause whatsoever, is losing grant ; thus education authorities lose large sums on account of children absent through illness. Many children whose attendance is very irregular may have their health so far restored by a short stay at the Open Air School that they may return to an ordinary school and earn full grant by regular attendance.

These considerations serve as a set-off to the objections to Open Air Schools on the score of expense.

Sir George Newman, M.D., Chief Medical Officer of the Board of Education, has summed up the Open Air School idea as follows—The Open Air School is not merely a school in the open air. It comprises a way of life and a system of treatment, including the following—

1. Fresh air and sunlight.
2. Proper diet.
3. Rest.
4. The hygienic way of life.
5. Individual attention.
6. Medical treatment.
7. Special educational methods.

These, then, are the cardinal points of Open Air Schools, and the success of any particular school will be measured by the sum total of the success in each of these directions.

We have now the advantage of ten years' experience in this work, and the enthusiasm which greeted the results of the first experiment has spread over the whole civilised world. The remarkable part of it is that there have been no failures at all. Wherever a school has been opened, whatever the climatic conditions, and whoever has undertaken the responsibility of the work, success has been attained.

Surely no further proof is required that success is limited neither to places nor people but by the degree in which the principle is adopted.

Ten years' experience has given positive proof that the capabilities of an Open Air School include all the following.

(i) Nipping disease in the bud. For reasons given above it will be seen that the school is more likely than any other existing agency to be successful in dealing with incipient disease.

(ii) The prevention of sequential disease. Diseases of children take a very different course from diseases in adults. In childhood, if one organ is diseased other organs rapidly follow suit, the disease is local only for a very short time, it soon becomes general ; moreover, there is usually a quick response to treatment. Diseases of adults differ in each of these respects, for, when one organ is affected the other organs may remain healthy for an indefinite period. On the other hand, the disease is apparently more deeply seated, so that much more treatment is required to effect a cure.

(iii) The Open Air School supplies opportunities for physical repair. I have been fortunate enough to have had two boys under my care in an indoor school and then again in the Open Air School. Under the former conditions they were thin and absolutely miserable in appearance, exciting the sympathy of their classmates, yet always shy and retiring, spending their playtime slinking along the school wall, only anxious to keep out of the way of others engaged in games. A short stay in the Open Air School, and these same boys began to join in the play ; they began to run, to jump, and to laugh ; they put on flesh, their chests expanded, and finally they became leaders in sport—the one, centre forward in a football team, and the other a full back. These changes took place in a few months, and it is only a short time since that one of them, now a brawny A.B. in the Royal Navy, visited the school and indicated his appreciation of the change made in his life by the Open Air School treatment.

(iv) The Open Air School nurtures debilitated children. The opportunities for medical treatment, good food, rest, and especially the small classes enabling the teacher to give individual treatment, have had a remarkable effect on the children. Even if they belonged to wealthy parents able to afford a doctor, nurse, and tutor each, it would be impossible to care for them in a manner more efficient for fitting them to take their place in the world. The success from the physical point of view may be judged by a glance at the photographs of children on entering the school and again a few months later (*see* Frontispiece) ; also by an examination of the medical charts, showing the improvement in weight, height, and percentage of haemoglobin in the blood (*see* p. 69).

(v) The Open Air Schools have taken the lead in modern methods of education. Learning by doing is making rapid headway in all types of schools ; but in Open Air Schools, owing to the small classes, the environment, and the special needs of the children, teachers have found it not only easier, but absolutely necessary, to adopt manual methods of education. This has been done with so much success that inspectors, lecturers in training colleges, teachers of all grades, have come from every quarter to learn the new methods, not only for adoption in other Open Air Schools, but also to be introduced into indoor schools of all kinds. The following extracts from teachers' diaries will indicate the good results which have followed the adoption of these new methods coupled, of course, with the beneficial influences of the school as a whole.

(1) J. A., age 11 years.

April 19, 1912. A mouth breather, slow to move. Draws very well. Fairly neat worker. Slow to comprehend. Answers little.

Takes little interest in anything. Has had scabies recently—consequently he keeps apart.

July 13, 1912. Still very slow and very inattentive. His answers to questions are generally correct when he awakens himself sufficiently to comprehend the question.

March 29, 1913. Has brightened up considerably, and between last report and this has worked very hard—obtained a prize.

(2) G. B., age 8 years.

April 12. Quiet disposition. No power of concentration. Mental ability—moderate. Power of expression—poor.

June 18. Power of concentration a little better, also slight improvement in power of expression.

December 16. Mentally brighter. Is more active. Great improvement in power of expression. Quick to answer questions.

(3) E. H., age 12 years.

April 8. Has not attended school for two months. Children can evidently lose a good deal of the effect of school training in two months. Is lazy, and adopts quite an indifferent attitude towards work. Does not seem trustworthy, and is not amenable, it seems, to moral suasion.

July 13. When I think of this girl I cannot help but marvel at the rapid improvement she has made in her attitude towards work. By painstaking attention she has become one of the best artists in the class, both with the brush and in repoussé.

(4) W. D., age 12 years.

April 8. Has to go very steadily with manual work. Is apt to be inattentive, but is conscientious and straightforward. Has not been to school for two years, and so is very backward in written work.

June 28. Some people, through once being outspokenly honest and finding it pay, allow it to grow to be a personal peculiarity—I am beginning to wonder whether this boy has developed this habit.

Through individual attention he is beginning to pull up in his written work.

March 30. Has become one of the finest workers in the class. When I read the first entry above I can scarcely believe it.

Was chosen top boy by ballot of the other boys and a tree planted in his honour.

THE UFFCULME OPEN AIR SCHOOL

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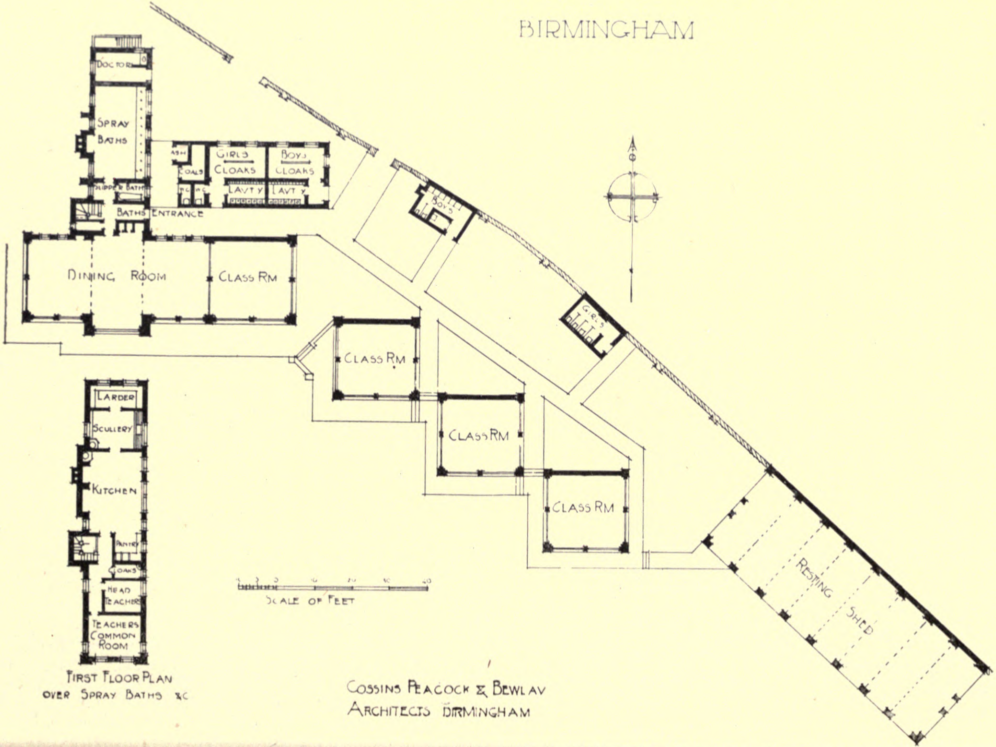


FIRST FLOOR PLAN
OVER SPRAY BATHS &C

COSSINS PEACOCK & BEWLAY
ARCHITECTS BIRMINGHAM

CHAPTER II.

Suitable Sites and their Equipment.

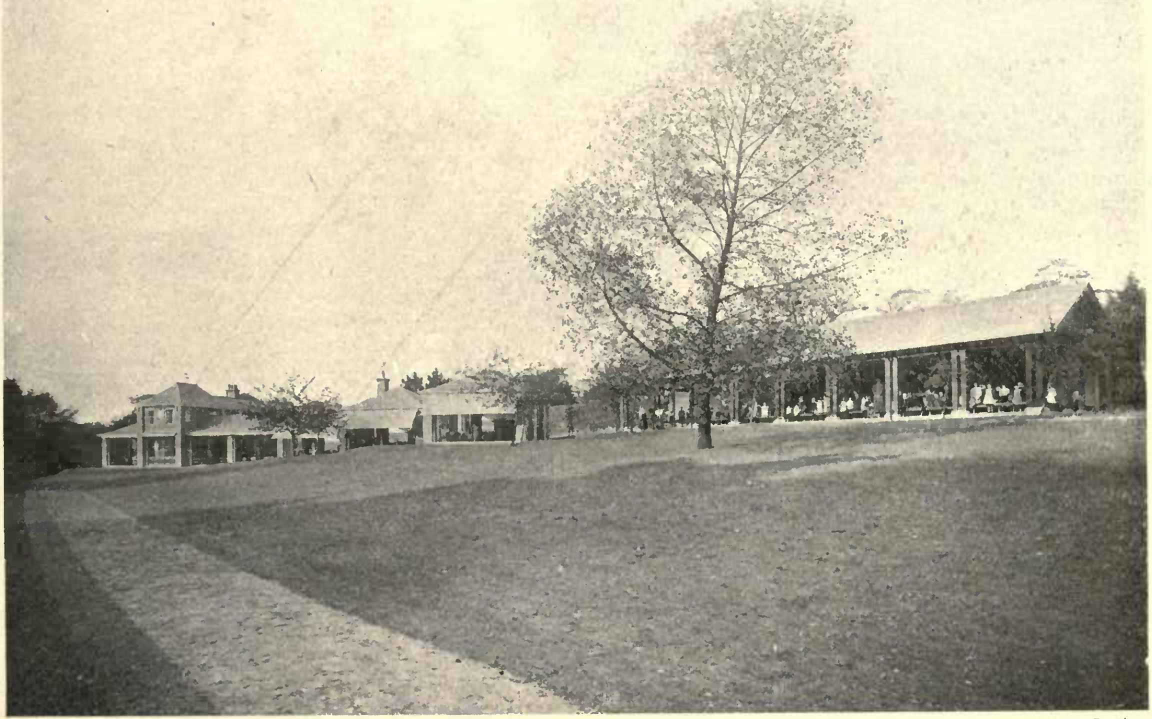
THE authorities at Charlottenburg were fortunate in securing a part of a pine forest within easy reach of the town as the site of the first Open Air School. The presence of pine trees indicates a gravel soil and good drainage, conditions much to be desired for our purpose ; moreover, the air of a pinewood contains small quantities of sweet-scented vapours which are generally regarded as having a healing effect in throat and lung affections.

Where pine trees are not available, it is extremely important that the site should contain some large trees for the sake of shade. It must be remembered that most of the lessons will be given absolutely in the open air, and even when the direct rays of the sun are not more than comfortably warm the strong light has an injurious effect on the eyes, especially when drawing, reading, or writing lessons are in progress ; to arrange the class in the shade under a tree is a great relief in such circumstances. Moreover, woodland makes the best playground: the undergrowth may, and will, suffer, but the surface soil, containing so much humus, will stand any amount of wear and tear without suffering in the least, either from the point of view of the players or in general appearance. Nobody expects Nature to be tidy, and there is always a litter of dead leaves and twigs on the ground ; but yet, so long as there is a rigid ban put upon dropping pieces of paper and other waste material, the woodland site will always have a pleasing appearance without attention from the caretaker. A stretch of turf is also valuable in many ways, but it quickly deteriorates if subjected to hard wear, and therefore it should be used carefully. Opportunities for frequent glances at green grass are a valuable aid to education; the varying shades unconsciously affect the artistic sense and, generally speaking, produce a frame of mind most conducive to mental activity. It is good, then, to secure a site on gravel soil at the outskirts of a wood, including both woodland and meadow. Four acres will not be a bit too much for a school of a hundred children—if more land is available so much the better.

The next consideration is the aspect; we require fresh air, sunshine, and protection from cold winds. These will be secured if the school is situated on the southern or south-western slope of a hill. The trees should be higher up the slope with the meadow land below; then both trees and hill-top will shield the scholars from chilly north and north-east winds. Such a site will command a view of the surrounding country which teachers will not be slow to take advantage of in the Nature study and geography lessons. The south aspect will be the ideal one in all parts of this country, with the possible exception of the southern coast: here the south westerly gales have to be considered, lessons in the open air would be impossible and delicate children would lose their breath; thus more harm than good would be the result of a stay in the Open Air School.

A further consideration is the means of access to the proposed site. This is not of great importance if the school is to be a residential one, but if the scholars have to journey from and to their homes daily it is necessary that the walk shall not be too far. Many municipalities allow free passes on the trams to children attending Open Air Schools; in some cases motor buses are used, and less often trains, but everywhere some such arrangement has to be made. The greater the need of a district for such schools, the greater the difficulty of finding a site within walking distance.

To sum up then: the ideal site for an Open Air School would



Photograph by *Thomas Lewis.*

GENERAL VIEW OF THE UFFCULME OPEN AIR SCHOOL.

(By permission of the "Modern Building Record.")

be on the south-western slope of a hill, gravel soil, part meadow land, part pine-wood, and easily accessible from the children's homes.

Needless to say, the ideal site has not yet been found, but sufficient has been said to serve as a general guide to those who have to decide in such matters.

BUILDINGS.

The majority of the existing Open Air Schools are accommodated in the grounds attached to buildings which have previously been private dwellings. In such cases the houses have been made to serve for many useful purposes, thus saving the expense of the erection of certain necessary buildings. The house may provide a kitchen for the preparation of the school meals, store-rooms, private rooms for the staff, rooms for medical inspection, bath-rooms, accommodation for the caretaker and his family, and so on. In the case of a residential school it may be possible for certain rooms of the house to be adapted for use as scholars' bedrooms or dormitories, but it is extremely unlikely that it will be wise to use any existing apartment of the house as dining-room, class-room, or resting room for the scholars. These debilitated children require fresh air and sunshine, and any unnecessary restriction of these aids to health will militate against the success of the school. On first thoughts it would appear most economical and convenient to include under one roof apartments for all school purposes; indeed, this is the idea which has been adopted at Bradford—the first town in this country to put an Open Air School on a permanent footing—but there is a very strong argument against such a plan. A moment's thought will show that every room in such a building will be shut in on one, two, or three sides, the illumination will not be so good, and perfect ventilation under all weather conditions will be impossible. This is no mere quibble, for there is a real difference in the intensity of the light in a room with windows on three sides and one with similar windows on all four sides. Any amateur photographer knows the increase in the exposure required on a dull day as one passes from the open field to a subject under a tree. Continue from such a spot into a well-lighted room and a further considerable increase in the exposure is required. Now, as the majority of the scholars in an Open Air School are anaemic, sunlight is necessary to effect a cure; blank walls then are a distinct disadvantage. Now for the question of ventilation—in an average year there are very many wet days which are comparatively warm. Frequently, in such weather, the air in a room quite open on one or even two sides becomes vitiated and unpleasant—surely a very undesirable state of affairs in an Open Air School.

Long experience in such a school has convinced me that detached classrooms are the only solution of the difficulty. I mention classrooms especially, since they are used more than any other rooms on the wet and cold days, but the question is an important one, and, speaking generally, we should aim at securing fresh air conditions whenever the weather makes it necessary to be under cover.

For a day Open Air School the following buildings are necessary—

(*a*) Classrooms.
(*b*) Dining-room with kitchen.
(*c*) An assembly hall which could be used for the mid-day rest in inclement weather.
(*d*) A building to accommodate apartments for doctor and nurse, bath-rooms, head master's office and store-rooms, and sitting-rooms for staff.
(*e*) Lavatories.
(*f*) Caretaker's house.

A residential school would require, in addition, dormitories, and bedrooms for the night-staff.

The classrooms of an Open Air School are usually intended to accommodate twenty-five children. The classes are small because the scholars need individual attention much more than if they were in good health ; moreover, the instruction has to be given largely in an informal, interesting and practical manner, and without the rigid discipline so necessary with large numbers. For such a class, a room of 20 ft. square will be of sufficient size. It should be of such a type that practically open air conditions are possible in all weathers. This means that wall space must be reduced to a minimum. Many suggestions have been made—the most novel being that the sides should be hinged at the top, so that when not required they may be pulled up inside to form the ceiling of the room. Demonstrations with a small model made it appear delightfully simple, but before it could be practicable on a large scale it would be necessary to find a very light, yet very strong, material for its construction. Some education authorities have spared no expense to equip Open Air Schools well, and the common practice under such circumstances has been to provide each class with a room quite similar to those of an ordinary school.

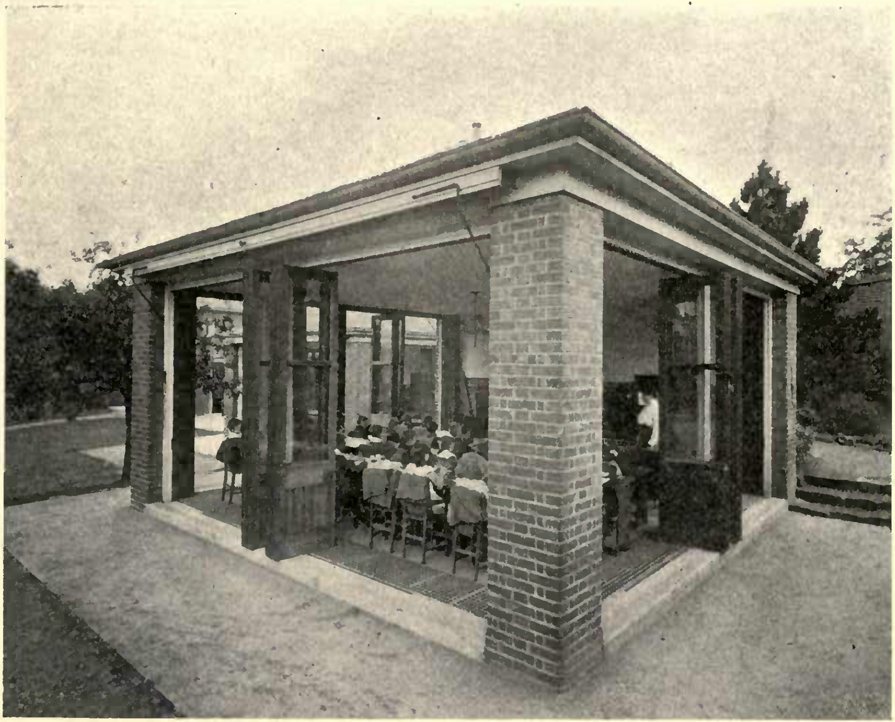
Each classroom has a verandah as large as itself, open on three sides. It is intended that the verandah should be used for teaching purposes whenever the weather proves suitable, while on wet or cold days the class should be transferred to the room behind. It is surprising how often the classroom is found to be more comfortable than the verandah, and on all these occasions the children are no better off, as far as air supply is concerned, than the scholars of an ordinary indoor school. Although the system is a good one from the educational point of view, yet from the standpoint of health it cannot be regarded as the best arrangement.

A very convenient classroom has been designed by Mr. A. J. Green, the Head Master of the Birley House Open Air School, Forest Hill, S.E. The design has been put into execution by the elder boys of the school (age 12-13 years), and you have the unusual state of affairs of a class meeting in a room of its own construction. The building is rather small for the purpose, being but 15 ft. square, but if the school is extended and other classrooms are required, they will be built larger, but after the same design. The skeleton is of stout timber, the roof is of canvas, the sides consist of panels made of canvas stretched on a wooden framework.

The panels are easily removable, so that in two or three minutes the whole side of the room can be taken away. The lower panels are 4 ft. 6 in. high and remain in position in windy weather—then air currents cross the room above the children's heads. The upper panels are of a thinner material, allowing light to pass through ; they are used when rain is falling, and then only on the windward side to prevent the rain driving in. The canvas is treated with Solignum (a patent preservative resembling Stockholm tar), which serves to reduce the shrinkage in wet weather, but the slight tightening up of the panels when wet makes them more waterproof, and no rain finds its way into the room even during a heavy downpour.

The total cost of the materials for the existing classroom was £10, but if a larger sum is available Mr. Green advocates the substitution of wooden roller blinds for the lower canvas panels. Such blinds would be made to work horizontally, the rollers being fixed vertically in the corners of the room.

The illustration of the classroom at the Uffculme Open Air School (Birmingham) indicates the chief features of a very successful attempt to provide suitable accommodation for teaching purposes. Indeed, similar commendation might be



Photograph by *Thomas Lewis.*

CLASSROOM AT THE OPEN AIR SCHOOL, UFFCULME.

given with regard to all the buildings at this school, for at the present time they are the best of their kind in the country.

The photograph of the classroom should be studied in conjunction with the plan of the whole school (*see* p. 22), and it will be seen that the architect has turned to good account even the apparent disadvantage of the site, namely, its irregular shape. The latter made it convenient to put the classrooms close together, but in such a manner that the classes should not suffer from mutual interference.

The rooms may be open on three sides, while on the fourth (the north side) there is a blank wall giving accommodation for blackboard pictures and cupboard. On the east, south, and west, protection from strong winds may be secured by closing the folding doors.

The arrangement approaches perfection, yet I venture to make two suggestions for its improvement. First, that the doors should have movable window sashes similar to those in railway carriages. Thus, during a period of strong wind when the doors to the windward would be closed, the windows on that side might be open to admit the air, but in such a manner that it would pass over the heads of the children. Doors of this kind would be heavier than those shown in the photograph, but it would be possible to reduce the weight by reducing the height and having swing windows above the doors.

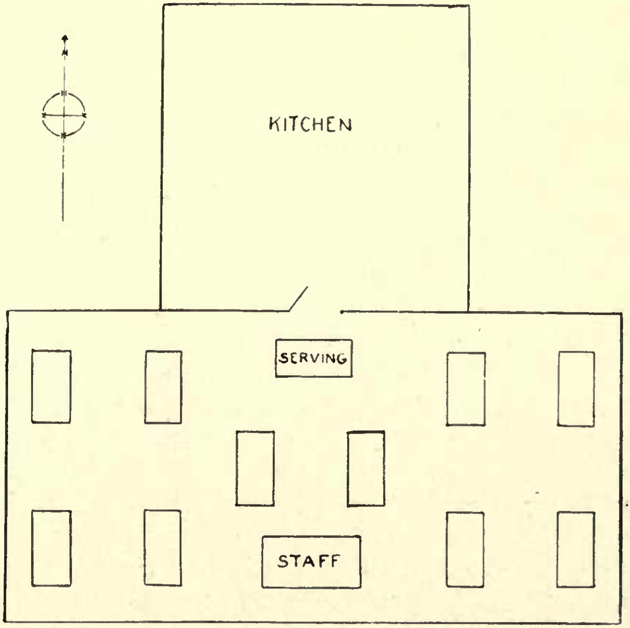
The second suggestion is that even the north wall should have an opening in the middle equal to half its width. Such an opening would be provided with doors similar to those on the other sides. It would be valuable in two ways—to facilitate the passage of air across the room in warm weather, and also to provide a bright outlook for the class. If I were teaching in the classroom shown in our illustration, I think I should turn the class round so that the children might enjoy the view of grass and trees. The boys and girls would be brighter, and references to the objects in sight would be of considerable value for teaching purposes.

It will be noticed that the room may be heated by hot water pipes, and a reference to this subject may be of some value. I would not have artificial heating at any time unless the temperature was below 35° F. Even strong, healthy people readily catch cold by passing from a warm room into the cold street during the winter. How much more is the danger with weak-chested children ? In cold weather the scholars should have active employment out of doors as much as possible. Vigorous physical exercise should precede sitting-down lessons, overcoats and rugs will serve to retain the natural heat of the body, and more physical exercise should follow at intervals of half an hour or less. On an occasion that some of us will not easily forget, the ink became solid in the ink-wells ; snow, blown into the classroom during the morning,was swept out in the afternoon without wetting the floor ; dinner was served with snow sauce, for there was no means of keeping snow out of the dining shed. This experience, though uncomfortable, was not followed by any ill-effects on staff or scholars—no one caught cold. For the sake of comfort, however, artificial heat is necessary on a few days. Heating by hot water or steam pipes is not convenient for scattered buildings ; neither is it suitable for intermittent use ; hence, in some schools, particularly those in the southern counties, stoves for burning coal or gas, or possibly electric radiators, will be substituted.

It should be remembered that children who live in the open air become acclimatised to cold, also that children have a better blood circulation than adults, and with similar clothing, the teacher will feel cold before the scholars. These facts, coupled with the danger of catching cold when using artificial heat, will make us very loth to light the fire.

The dining-room should be similar in construction to the classrooms, except where the adjoining kitchen would take away some of the window space. The building in plan might be T-shaped, the kitchen being at right-angles to the dining-room.

To accommodate one hundred scholars, with the staff, the dimensions of the dining-room should be about 50 ft. by 25 ft. Ten tables, each 6 ft. long, would be required for the children, and in addition a staff table and serving table.



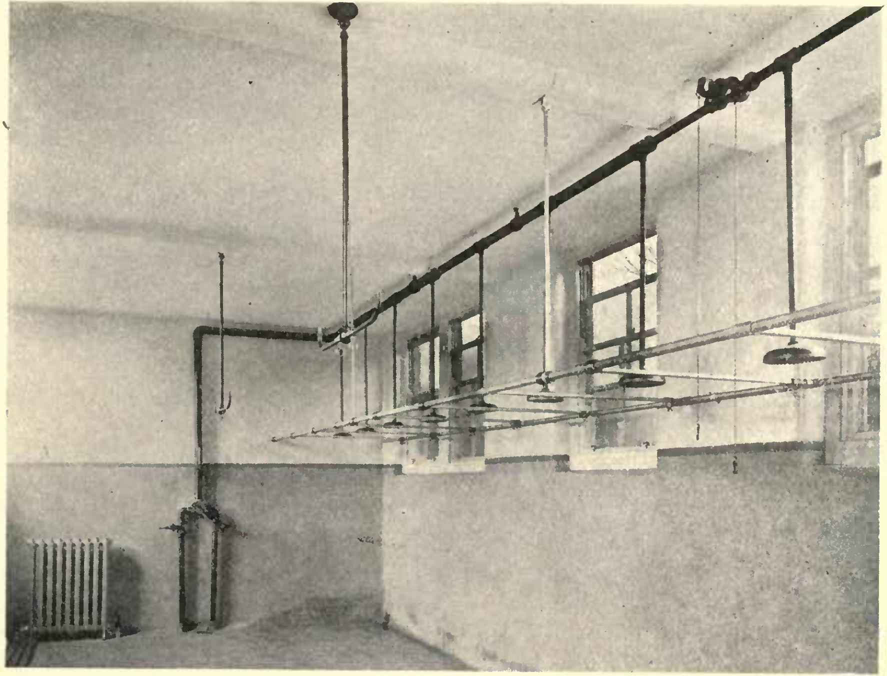
PLAN OF DINING-ROOM AND KITCHEN.

The assembly hall, again, will resemble the classrooms, but must be of ample size. For one hundred scholars the length should be about 60 ft., and the breadth 45 ft. It will be used in inclement weather, whenever the whole school has to be brought together for prayers, for singing, for the mid-day rest, and on all public occasions such as school entertainments and prize-givings. It could also be used as an extra class-room when necessary, for manual work, for games and for drill.

BATHS.

At Charlottenburg, bathing seems to have played a very important part in the life of the first Open Air School, for there anaemic and nervous children received two or three warm baths per week. scrofulous children two mineral baths per week. Every other child received two or three warm shower baths per week, and a warm slipper bath every fortnight. English schools have not followed suit to the same extent, yet all agree as to the value of bathing in the maintenance of health. For cleansing the skin, warm slipper baths are quite necessary, but, if the school is to consist for the most part of children who have their weekly warm bath at home, then provision need only be made for shower baths, the action of which is not so much cleansing as toning up the skin to enable it to do its work more efficiently than before.

The kind of bath required, then, is largely dependent on the district from which the children are to be drawn. If they are to come from a slum area, then, for a hundred scholars, a dozen slipper baths are necessary in order that the bathing may be accomplished expeditiously. Supposing the children are to come from cleaner homes then the slipper baths may be dispensed with and only shower baths provided. At the Bradford Open Air School there are provided for a hundred and twenty children sixteen douches in sets of four, three special douches for elder girls and one slipper bath. There are sixteen dressing boxes, and the large bath-room has four troughs 9 in. deep, each to accommodate four bathers. When the children are in position the teacher regulates the shower from the side. The temperature may be varied by



Photograph by *Thomas Lewis.*

THE BATH-ROOM AT UFFCULME.

admitting more or less hot water, and a thermometer let into a glass section of the supply pipe enables the teacher to adjust this to a nicety. It would, probably, be better to dispense with the troughs and have simply a sloping floor to obviate the danger of falls when the feet and floors are slippery with soap. The latter plan has been adopted at Uffculme.

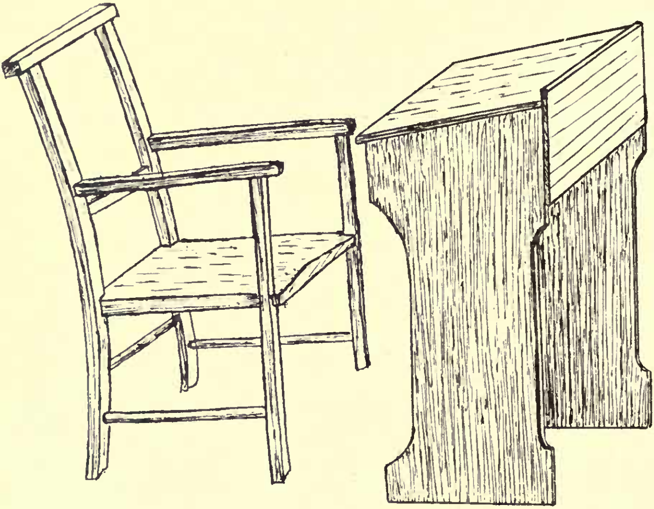
DORMITORIES.

The simple arrangements which are made for the mid-day rest are not suitable for the longer sleep at night; hence, for a residential school, other arrangements must be made. The dormitories might well be situated on an upper floor of the building which accommodates the bath-rooms, and, again, ample window space should be provided, so that in fine weather all sides may be open.

FURNITURE AND OTHER EQUIPMENT.

The furniture for the classrooms need not be different from that supplied to ordinary schools, but, in addition, each class should have light forms which may be carried about for lessons in the open. An alternative arrangement, and, perhaps, a better one, is to provide each scholar with a chair (a little wooden arm-chair would do splendidly), for use when sitting at the desk in the classroom, one that could be carried outside for the outdoor lessons. During fine weather, only such lessons as require careful written work will be given in the classroom. All the others will be out of doors; indeed, apart from reasons of health, the teacher, usually, will be glad to take up his position with no other roof than that provided by the branches of a tree. When the ground is damp there should be a raised wooden floor for the outdoor classes. Since these floors must be portable, they should be in sections, made of pieces of batten

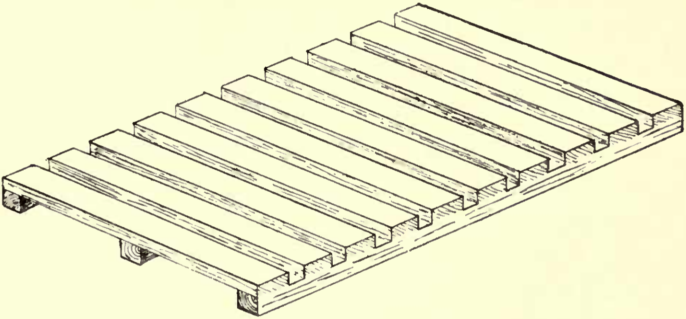
1 in. apart. These sections, or "slats," may be made by the boys as a simple woodwork exercise, and, when placed end to end, make excellent temporary pathways in wet weather. A convenient size for a slat is 6 ft. by 3 ft. 6 in. for which one requires three pieces of 2 in. square deal, each 6 ft. long, and twenty-four pieces of 2 in. by 1 in. batten, each 3 ft. 6 in. long. The slats should be well tarred before use, and have further coats of tar at intervals of twelve months; they should last for seven years even with hard wear.



DESK AND ARM-CHAIR SUITABLE FOR SCHOLARS IN OPEN AIR SCHOOL.

Other special requirements include a generous supply of the commoner garden tools, especially spades and trowels, these being not for gardening only, but for the geography and history lessons, as will be explained hereafter. Two or three carpenter's benches, woodwork tools, one or two soldering outfits with files, cold chisels and vice for simple metal work, a couple of bricklayer's trowels, paints and paint brushes, will all be exceedingly useful, for the Open Air School teacher has to be jack of all trades and master of some.

Equipment of quite another sort will include a mackintosh cape and a pair of clogs for each scholar for use in wet weather. Experience has proved that these should be very strong; tarpaulin is the best material for capes, and the clogs, while having thick wooden soles, differ from the usual Lancashire clog in that they reach two or three inches above the ankle. Children, especially girls, object to wearing clumsy clogs at first, but after a time they get used to them and readily put them on when the ground is inclined to be muddy.



A SLAT.

Rugs will be required for the cold weather; these may be coloured blankets, 6 ft. by 4 ft. 6 in., such as may be purchased wholesale at thirty shillings per dozen. With these, children will be able to sit in comfort in the open air throughout the greater part of the winter.

Other special equipment will be discussed under the headings—Feeding, Sleeping, and Medical Inspection and Treatment.

CHAPTER III.

Staff and Scholars.

A DULL child is very frequently an ailing child ; take away the ailment and usually the little one brightens up mentally. It is not true, however, that the dull child is always a suitable case for the Open Air School ; indeed, very much care must be taken to see that, when there are available an ordinary school, an open air school, and a mentally deficient school, the proper allocation should be made. It is quite necessary, then, that both the preliminary and the final selection of children for the Open Air School should be made on medical grounds only.

The bulk of the admissions should take place in April or May, since the summer is the best time for the new scholars to become acclimatised—hardened, as it were, to withstand the winter cold ; moreover, the old scholars who are displaced and return to ordinary schools are able to continue the open air life to a much greater extent in the summer than in the winter, and the transition to indoor conditions may be a gradual one.

Most children catch cold during the first few days at the Open Air School, but it is in no way serious—it is well for the teacher to address the new scholar somewhat as follows : " Now, Tommy, to-day you may catch cold, to-morrow you may be sneezing ; but don't stay away from school, because by the next day you will be better, and you need not catch cold any more."

In many cases, six months at the Open Air School is sufficient to restore the ailing child to normal good health ; this is especially true where the debility is caused by insufficient or unsuitable feeding. Tubercular children usually require a much longer period before they can be certified as fit to return to ordinary school, and in the case of those with heart disease the progress is so slow that two or three years at least are required before good health is regained. The average period for all scholars is about twelve months, and this is an important factor for the consideration of both education committees and teachers. Those that have charge of the people's purse must remember that by establishing a relatively costly Open Air School for, say, one hundred scholars, every year they are absolutely curing one hundred physically debilitated children, many of whom would otherwise spend a lifetime in sanatoria and infirmaries largely at the public expense. The Open Air School teacher must remember that his scholars are but birds of passage, and he must make his arrangements accordingly. He will find it much harder to secure a good tone—that *esprit de corps* so valuable in every school, and so easy to get when the senior scholars have spent all their school life in the one school, and where traditions are handed down through whole families all associated with the same school and the same teachers.

The constantly changing class means constant disappointment, for nearly every new scholar is apparently duller than the one who has just gone ; to cope with this there must be constant modification of rules and methods. The teacher must be an optimist, he must regard the departure of an old scholar as the culmination of a successful effort ; he must compare the new scholar with the original and not the final condition of his predecessor.

Most Open Air Schools have to face another difficulty, namely, that of classification. On account of expense, accommodation is provided only for the most needy cases, and thus a small school is made to serve a large district. It is obvious that, unless children are to travel long distances from their homes, the Open Air School must be a small one; moreover, suitable children for the school are those least able to bear long daily journeys. The existing Open Air Schools have accommodation for numbers varying from forty to one hundred and twenty. While the lower age limit is usually fixed at seven or eight, there are some children who are only fit for infants' classes, while the others include representatives from all the classes of the senior departments of elementary schools. Four classes is the least number that can be regarded as at all satisfactory; even then there is likely to be a wide divergence in mental attainments between the best and the worst of the same class. Under these conditions the monitor system is a very valuable aid to the teacher, for the brighter children will relieve him of a great deal of the more mechanical part of his work —acting as captain to march the class from one part of the school to another, taking charge of one of the dining-tables, supervising a section of scholars when the class is divided up for different kinds of manual work, and so on.

Small numbers mean that good discipline is easy to maintain, and serious punishment is but rarely required. Teacher and scholars learn to know and to understand each other; something of the family spirit begins to show itself and results in happy, good behaviour. A child is often jealous of another whom he regards as a rival, physically or mentally, but usually a feeling of sympathy at once comes for one who is undoubtedly inferior; so it is that in the wide variety of types that make up the small number of children in the school there are many opportunities of fostering that sympathetic spirit.

That the teacher appreciates the practice of good fellowship or comradeship may be shown in many ways and at all times, but, with this idea in view, regularly in the autumn of each year, we have found it a good plan to plant a couple of young trees. At the end of the year the scholars are asked to select a boy and a girl from among their number who, in their opinion, are pre-eminent in the possession of the spirit of comradeship. The trees are labelled with the names of those chosen, and thus we have a sort of honour board always increasing in size and improving in appearance. Moreover, a collection of trees is gradually being made which is very useful in many other ways.

There is still another difficulty associated with the small size of the school, namely, that of mixed classes. It is usually accepted that older girls are best under the care of a woman, and similarly older boys under a man. My own experience is that the one teacher, whether man or woman, can be as successful (as far as mere learning is concerned) with a girls' class as with a boys', the difference being one of method; when, however, the sexes are together, then the difficulties begin.

The mixed school necessitates a mixed staff, and usually men and women should be in equal numbers. The question of the head teachership is a very vexed one. For economy's sake a woman is frequently appointed, but where there are men on the staff the head should be a man. In some schools the difficulty is overcome by having only women on the staff. This is surely unfair to the older boys, who will get little of that manual training for which they are most fitted, and which is a most potent factor in the recovery of health.

The whole of this sex difficulty may be overcome by making the school, in part at least, a residential one. Then its constituency may be much larger, more accommodation will be necessary, and there may be separate departments for boys and girls staffed independently of each other.

The head teacher of such a school should have quarters provided, and should be solely responsible under the Managing Committee for the entire care of the children. The assistant teachers should be on duty only for the ordinary school hours, while a qualified nurse acting as matron should supervise the preparation of meals and the sleeping arrangements.

Great as has been the success of the day Open Air Schools, still greater may be the success of the residential schools, since the home conditions are frequently all against the welfare of physically debilitated children. The cost will not be proportionately increased, because one large school well out of the town will not cost more than the sum total of several small schools in the suburbs, and the rate of improvement with many of the scholars will be more than doubled.

A great deal of misunderstanding exists as to the teachers required for an Open Air School. So many have the idea that this type of school will be just the thing for teachers suffering from nervous breakdown or otherwise in delicate health, and that as soon as they have regained their strength they should make room for others. Never was there a greater fallacy—if children need a bright, active teacher while they are well, how much more so when they are ill. There are days wet and dreary, the desks clammy, the air reeking with moisture, the scholars dull, the teacher—miserable and ill? That is the time when the teacher must be as sunshine, just cheery and bright with a natural happiness that shall be infectious. Only with such a staff will the school be really a success.

Children in the open air are like many of those so-called simple barometers—they don't serve to forecast the weather, but they change with it. In bright sunshine they are listless, a brisk breeze springs up and it seems to get into their heads, a passing thundercloud imparts its electricity to them, one kind of weather followed by another acts on them as one portion of a Seidlitz powder followed by the other acts on water; there is a restlessness which tries the teacher's patience, and which can only be overcome by a strong personality and a real interest in the work. The teacher then should be just one who is fond of outdoor life, and who can be cheerful under all weather conditions. Take, for instance, one of my colleagues, who said during a wet period that had already lasted a fortnight, " Well, let's thank Heaven there's no dust ! " Fondness for music, art, nature, games, manual work, is a qualification to be looked for in the Open Air School-teacher, but, above all things, a love of manual work. A subsequent chapter will show the truth of this.

School holidays are usually most valuable in the summer, but most scholars are better off in the Open Air School than they would be on holiday. It is well then to have the school open all the year round, except on public holidays, when it would be difficult to enforce attendance. In the London schools this plan is adopted, and as the teachers take their leave in turn (eight weeks each per year) an extra one is appointed on the staff ; thus at the Shooter's Hill Open Air School, where the accommodation is for a hundred children divided into four classes, there are a head and five assistant teachers, but there is always one away except for four weeks in the year. One teacher has no class of his own, but undertakes the duties of all the others in turn as they are on holiday.

The first Open Air School—that at Charlottenburg—was open seven days a week ; its successors in other German towns for six days. The latter method was adopted in London, except that on Saturday afternoons attendance is optional. The newer day Open Air Schools are open for five days per week only, and this seems the best plan, as, though from the health point of view many of the children are best at school, yet for the sake of the staff Saturday closing should be the rule. The multitude of classes and educational excursions arranged for Saturday mornings indicate that teachers regard this time as providing opportunity for increased mental equipment, of which the schools get the benefit. Moreover, it must be remembered that the attempt to enforce Saturday attendance on the scholars has never been really successful ; the majority of parents are opposed to it, and the tendency has been to produce friction between school and home.

Besides the teaching staff, there will be required a nurse (more than one if the school is to be residential), a caretaker, and the kitchen staff in the proportion of one to every thirty-six scholars.

CHAPTER IV.

Feeding.

WE have to deal in this chapter with what may be regarded as the basis of good health. A large proportion of the children attending Open Air Schools have not been properly fed—sometimes on account of poverty, but far more frequently through ignorance, or because parents do not exercise their authority with regard to food. Many of the children live on pastry and jam, fried fish, pickles and culinary herbs, in fact on anything highly flavoured, tasty, and filling, without regard to digestibility and nourishment. A child has been delicate from birth, peevish, and of poor appetite—no wonder that the fond mother pets and pampers such a one; her ingenuity is taxed to contrive something appetising, and if one thing is rejected something else must be substituted, until it comes that mere eating is an end in itself, and not treated as the means of building up a constitution. Such children are best away from their homes at meal times, for, sitting down with those of good appetite, those who eat and enjoy plain nourishing food, these pampered children commence new ways; they hate to be different from the rest, and they begin to eat what at other times they would have spurned. The fresh air sharpens their appetites, and in a few weeks they will eat with evident pleasure a meal that would satisfy a full-grown man. In these cases the good result was attained in the first place by an effort of will, but in some instances that is not sufficient. There are a few children who have had unsuitable food for so long that, try as they will to take plain food, the stomach will reject it. Such a child is in a pitiful state, and much patience is necessary. Usually the following plan is successful: insist on the taking of a small portion, say two spoonfuls or even one spoonful, then let the plate be taken away, but give nothing else in its place. All the available digestive fluids are available for that small portion of unaccustomed food, and consequently it is assimilated. The next time a larger quantity may be taken, and, before many weeks are past, the appetite is normal. We have a boy in the school at the present time who, six months ago, could not eat bread and butter, bread and jam, porridge, vegetables, stews, or milk puddings ; he could not drink milk or tea. Yet now he takes all these things, and occasionally asks for a second helping. Three factors are conducive to success with these difficult cases : first, the example of the other children ; second, the fresh air sharpening the appetite ; and, third, the child's only choice is to eat or to go hungry. With the assimilation of plain food of good quality the physical condition immediately begins to improve.

Some scholars are just the reverse. For the first few days or weeks they have a voracious appetite : they gaze at the food with wolfish eyes, they are impatient at any delay, and it seems impossible to satisfy them. These are the children who have felt the pinch of semi-starvation, and plenty to eat is all their need—that is what they tell you. Here again the digestive organs have unaccustomed work to do : they cannot assimilate all that is eaten, the stomach becomes overloaded, and in a short time, to the surprise of all, you find these erstwhile insatiable appetites disappear and the children are dissatisfied with the food provided. In such cases there are two simple remedies : first, a dose of some purgative ; or, second, and this is much better, let the child's stomach have a rest—just for one meal or perhaps two—and the appetite will return.

It has been suggested that the dining-room should be provided with tables 6 feet long by 3 feet wide to accommodate ten children. Ten is a very suitable number, both for quick service and for efficient control. Four children sit on

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5.

each side of the table, and one at each end—those sitting at the ends of the table are the monitor and vice-monitor. They are responsible for table manners, they regulate the conversation, and arrange for the service and the clearing of the tables. Two other children from each table should act as waiters, and bring the plates of food served out by the kitchen staff at a special table for the purpose. The monitors may be chosen by the children or by the teacher, and they in their turn choose the vice-monitors and the waiters. Some of the scholars' tables will be further away from the staff table than others, and consequently the children will be less under control; it is a good plan then for the tables to be numbered, and for the children to move round from table to table at stated intervals so that in turn all are near the staff table. As a further precaution against unfairness owing to the weakness of a monitor, it is a good plan to arrange that each set of children has a regular change of monitor; this may be accomplished by making each set of children change tables twice a week, but the monitors only once a week.

The table equipment for the dining-room should include three sizes of plates; the most useful are soup plates, which serve for porridge, bread and milk, soups and stews; dinner plates and tea plates are also required. Plain white earthenware looks well, and is very serviceable, and to allow for breakages the number of each kind of plate provided should be twenty per cent. above the number of children.

White enamelled mugs of half-pint capacity are better than cups and saucers, and no teaspoons will be required for scholars' use, as the tea and cocoa will be served ready sugared. Each child will need a small knife and fork and a dessert spoon.

Let us turn now to the question of the food itself. In arranging the menus there are four main considerations—

(1) The amount of nourishment and the correct proportion of the various nutritive elements.

(2) The attractiveness of the food.

(3) The utensils and the amount of labour required in the preparation of the food.

(4) Cost.

Children do not need supper; they want it, of course, if they are used to it, but it is largely a matter of habit. Provided they do not have tea too early, their health is likely to be better if they have nothing to eat between tea and breakfast. For both day and residential schools, then, we have to concern ourselves with three meals—breakfast, mid-day dinner, tea.

The following menus are to be regarded simply as suggestions, and may be varied to suit seasonal supplies or merely for the sake of change. The charge of monotony in the menus is usually made against institutions of all kinds, but really there is no need, for there may be as much variety as in the home with very little extra trouble. Frequent surprises make the meals much more attractive.

BREAKFAST.

1. Porridge, sugar, milk; bread and dripping.
2. Bread and milk; a raw apple, or some other fruit such as plums or grapes when they are cheap.
3. Soup, bread.

DINNER.

1. Roast beef, cabbage, potatoes. Baked rice puddings.
2. Beef puddings, potatoes. Boiled custard, stewed fruit.
3. Fish, bread, parsley sauce, potatoes; roly-poly jam pudding.
4. Soup, potatoes; currant puddings.
5. Shepherd's pie, haricot beans; custard or boiled rice, and stewed fruit.
6. Soup, bread; baked currant puddings.
7. Beef stew, potatoes; boiled rice and stewed prunes or figs.

8. Meat pies, potatoes ; custard and stewed figs.

9. Mutton broth, potatoes ; baked rice pudding or boiled rice and golden syrup.

10. Roast mutton, potatoes ; boiled plain suet pudding and golden syrup.

11. Macaroni, tomatoes, and onions, boiled in a mixture of equal parts of milk and water ; mashed potatoes.

This dish is suggested as an alternative to meat pies. It is pleasant to the taste and easily digested, though, of course, the absence of meat will be unfavourably commented on by some. The second course should consist of milk pudding and stewed fruit.

(N.B.—The mincing of beef for puddings and stews makes it more palatable.)

TEA.

The beverage should be very weak tea with plenty of milk, or weak cocoa with plenty of milk. Cocoa is very popular with most children.

1. Tea or cocoa ; bread and butter, and jam.
2. Tea or cocoa ; bread and butter, bananas.
3. Tea or cocoa ; bread and butter, cake.
4. Tea or cocoa ; bread and butter, apples or pears.
5. Tea or cocoa ; bread and butter, currant bread and butter.

Both brown and white bread should be available, so as to allow a choice as far as possible. Many children prefer brown bread, and if it is of good quality, that is, made from whole meal, it is decidedly better than white bread.

Unless the school is a very small one, the cost of the meals suggested above should not average more than sixpence per scholar per day. In the London schools half-a-crown covers the cost of a week's food—five full days, and breakfast and dinner on Saturdays. The following will give an idea of quantities and prices, the quantities being reckoned for a hundred scholars.

BREAKFAST: *Porridge and Milk, Bread and Dripping*—

	£	s.	d.	£	s.	d.
7 lb. Oatmeal	0	1	2			
4 lb. Sugar	0	0	9			
25 qts. Milk @ 3¼d.	0	6	9			
2 qtns. Bread	0	0	11			
1½ lb. Dripping	0	0	9			
				0	10	4

DINNER: *Roast Beef, Greens, Potatoes; Rice and Stewed Apples*—

	£	s.	d.	£	s.	d.
16 lb. Beef @ 10d.	0	13	4			
60 lb. Greens	0	2	6			
28 lb. Potatoes	0	1	6			
7 lb. Rice	0	1	2			
2 lb. Sugar	0	0	4½			
8 qts. Milk	0	2	2			
12 lb. Apples	0	1	6			
				1	2	6½

TEA: *Cocoa, Bread and Butter, Jam*—

	£	s.	d.	£	s.	d
5 qtns. Bread	0	2	3½			
3 lb. Butter @ 1s. 1d.	0	3	3			
8 lb. Jam @ 6d.	0	4	0			
6 oz. Cocoa	0	0	4½			
2 lb. Sugar	0	0	4½			
8 qts. Milk	0	2	2			
				0	12	5½
Total				£2	5	4

Average cost for the day, 5½d. per scholar.

All the prices given, with the exception of that for milk, are the ordinary retail prices, and are subject to a discount of 7½ per cent., which further reduces the cost; and the quantities are given on the assumption that all the food prepared is eaten at the one meal. In practice, however, there will be some things left from one meal which can be used at another time, and then less than the quoted quantity need be ordered. Reductions under these two heads will bring the cost down to about 5d. per scholar.

Let us take one other day's menus which are slightly more expensive—

BREAKFAST: *Bread and Milk, Raw Apples*—

		£	s.	d.	£	s.	d.
5	qtns. Bread @ 5½d.	0	2	3½			
25	qts. Milk @ 3¼d.	0	6	9			
4	lb. Sugar	0	0	9			
20	lb. Apples	0	3	4			
					0	13	1½

DINNER: *Shepherd's Pie, Roly-poly Jam Puddings*—

		£	s.	d.	£	s.	d.
18	lb. Beef @ 7½d.	0	11	3			
36	lb. Potatoes	0	1	11			
1	lb. Dripping	0	0	6			
	Onions, etc.	0	0	4			
1½	pecks Flour @ 1s. 10d.	0	2	9			
2	lb. Suet @ 8d.	0	1	4			
14	lb. Jam @ 5d.	0	5	10			
					1	3	11

TEA: *Cocoa, Bread and Butter, Bananas*—

		£	s.	d.	£	s.	d.
5	qtns. Bread	0	2	3½			
3	lb. Butter @ 1s. 1d.	0	3	3			
100	Bananas	0	4	2			
6	oz. Cocoa	0	0	4½			
2	lb. Sugar	0	0	4½			
8	qts. Milk	0	2	2			
					0	12	7½
					£2	9	8

Average cost for the day, 6d. per scholar.

On other days the figures are similar, but enough has been given to show on what lines the catering is done. In different districts the prices will vary with a proportionate effect on the cost. The section on curriculum will show how the scholars may produce a considerable quantity of the food in the school garden.

The average cost of meals per scholar per week should not be more than from 2s. 6d. to 3s. 6d. according as the number of days is five, six, or seven. This is simply the cost of raw materials ; 30 per cent. must be added to include the cost of cooking. Some authorities provide all meals without charge, and that is a very simple plan, but there are many parents who do not wish that their children should be fed at the public expense, and while poverty should not be a bar to the special privileges of the Open Air School, yet it seems only fair that parents should pay at least for the cost of materials as far as their means will allow.

SPECIMEN DIETARY TABLE FOR ONE WEEK.

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY	SATURDAY
Breakfast	Bread and Milk Raw Apples	Porridge and Milk Bread and Dripping	Bread and Milk Bread and Jam	Porridge and Milk Raw Apples	Bread and Milk Bread and Dripping	Porridge and Milk Bread and Butter
Dinner	Roast Beef Cabbage Potatoes Boiled Rice and Stewed Fruit	Beef Puddings Potatoes Custard and Stewed Fruit	Shepherd's Pie Roly-poly Jam Puddings	Fish Parsley Sauce Potatoes Currant Puddings	Meat Pies Potatoes Custard and Stewed Fruit	Soup Potatoes Boiled Rice and Currants
Tea	Cocoa Bread and Butter Jam	Cocoa Bread and Butter Bananas	Tea Bread and Butter Cakes	Cocoa Bread and Butter Bananas	Cocoa Bread and Butter Cakes	

The method adopted in London is that those parents who are unable to pay the full cost of the food have to make a statement of their income and the various claims upon it. The Managing Committee consider the statement and decide what contribution the parents shall make, often allowing the child to enter the school without charge ; others pay 6d. per week, and so on in varying amounts up to 2s. 6d. There are two weak points in this scheme: first, some parents make incorrect statements of their usual income and expenditure, thus it is almost impossible for the Committee to be quite fair to everybody; and, second, some suitable children are kept out of the school because their parents cannot come to an agreement with the Committee as to the amount of the weekly payment. The perfect scheme, however, has not yet been evolved. Many people argue that since Open Air Schools are too few in number to provide accommodation for all suitable children, some must of necessity be shut out. Very well, then, shut out those whose parents are not sufficiently interested to pay their share of the cost of the food. The argument is not a good one; for if there is not room for all, then those who are least in need of the treatment should be shut out.

CHAPTER V.

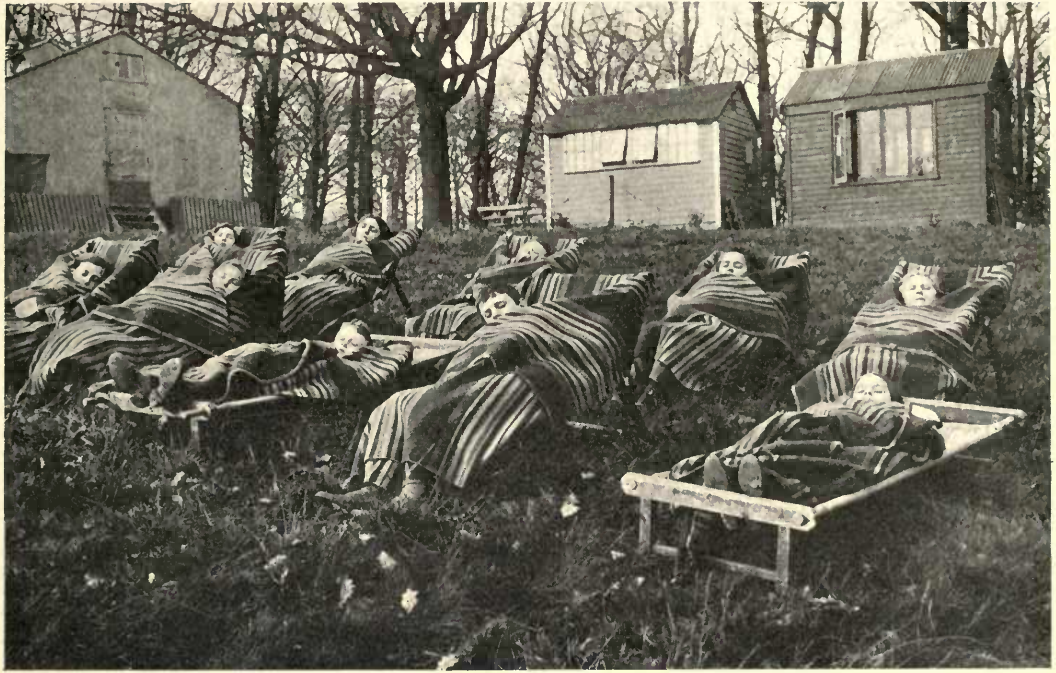
Sleeping.

> Innocent sleep,
> Sleep that knits up the ravelled sleeve of care,
> The death of each day's life, sore labour's bath,
> Balm of hurt minds, great Nature's second course,
> Chief nourisher in life's feast.
>
> SHAKESPEARE (*Macbeth* ii. 2).

FROM the beginning, the importance of sleep as a curative measure has been recognised in the Open Air Schools. Malnutrition and anaemia are very common ailments among children, including those for whom the best of food is available. For the proper assimilation of the nourishment in food, both fresh air and rest are absolutely necessary. One must also remember that the mid-day rest has a slightly different function from that taken at night-time.

After partaking of a good dinner there frequently arises a feeling of drowsiness ; this is due to the fact that for the purposes of digestion the stomach is making large demands on the blood supply ; there is a consequent reduction in the supply of blood to the brain, and this condition favours the contraction of the connecting tissues between the nerve cells, which results in sleep.

The physiological condition of a child during the mid-day rest should be as follows : the brain at rest, the voluntary nervous system at rest, the heart action slowed down, the whole of the available energy concentrated on the digestive system. If the dinner has been a suitable one, and the child has rested for two hours afterwards, then at the end of that time the whole of the nutritive portion of the food should be digested and be ready for repairing and building up the various tissues of the body. If, instead of resting, there is a period of



Photograph by *A. G. Williamson.*

THE MID-DAY REST.

The stretcher beds are in most respects preferable to the deck chairs.

forced activity after dinner, the probability is that the food will pass through the body without giving up the whole of its nutriment, and this probability is increased with anaemic children.

During the sleep at night time not only should the brain and voluntary system be at rest, and the heart and lungs less active, but the digestive organs should also be at rest as well. The whole of the available energy may then be utilised in the repair of the tissues to make up for wear and tear during the day, and also in children for the growth of those tissues. That is why children need more sleep than adults.

The conditions prevailing in many homes render it impossible for children to go to bed at night before the adults retire; moreover, in many homes where happier conditions prevail the children are allowed to sit up late. Sometimes home-lessons are held to be responsible for this, but whatever the cause such children do not get sufficient rest. It will be readily understood that sturdy growth is impossible under such conditions. The children become first anaemic, then puny. Malnutrition is caused by lack of rest as well as by insufficient or unsuitable food.

The remedies are obvious. In the case of the very poor children the home conditions should be improved, or, failing that, the children should be taken right away from their homes. In other cases the parents should insist that the children go to bed quite early in the evening. Good food and the provision of a mid-day rest, so that all the nutriment may be extracted from that food, are important factors in the cure of anaemia.

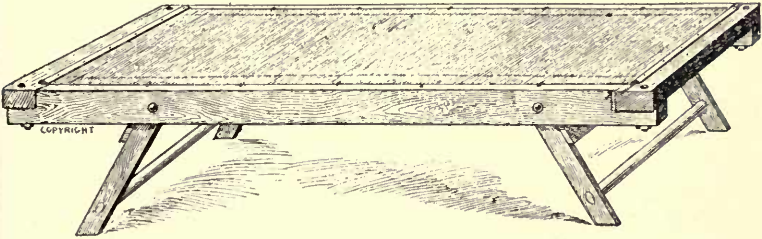
The Open Air School provides fresh air, food, and rest, and from time to time one hears statements as to the relative importance of these as curative agents. Usually, food is put first in order of importance, and yet some of the children in Open Air Schools have come from homes where the best of food is available. It is wiser not to lay down any hard and fast rule; some children are so well cared for at home that fresh air and sunshine are their greatest needs; many poor children are most in need of good food, and many, both rich and poor, need rest most of all.

In the London Open Air Schools, folding chairs of the type usually known as deck chairs or camp chairs have been supplied for the mid-day rest. They answer the purpose fairly well, since they are comfortable, they are easily packed up to occupy a very little space, and they are cheap. On the other hand, there are two disadvantages: when in use the head is too high, and there is no rest for the feet. The head can be lowered somewhat by having a couple of strong iron hooks on the back rail so that the headpiece may be extended beyond the base of the chair, and, further, a foot-rest may be provided. These additions increase the cost, and give much more trouble, so that at once we begin to look round to see whether there is something else to suit our purpose better.

One form of bed resembles a stretcher such as is used in ambulance work. Each end is supported on a low stand, having a hole on either side through which the ends of the stretcher rods pass. These beds are light and comfortable, and stand quite firmly, but it is impossible for children to erect them or to take them to pieces quickly and easily. Every teacher will appreciate the time it will take to give out three separate parts to form a bed, these to be carried some distance and put together, then the return, distribution of blankets, and second journey to the beds. At the conclusion of the mid-day rest these processes have to be reversed. What is needed is a bedstead which will fold quite flat in one piece for storing; it must be light, comfortable, firm, and capable of quick erection. Such a bed may, up to a certain point, resemble a deck chair in construction—a piece of canvas stretched on a rectangular framework, the legs folding up underneath when not in use, but with a stop to keep them rigid when erected. The legs at the head end should be slightly longer than those at the foot.

There is no reason that beds of this type should cost much more than deck chairs if the demand for them is sufficient, but, unfortunately, at present the prices are rather high.

Messrs. Wales, Ltd., Atlas Works, Birmingham, are prepared to supply suitable beds in quantities of a hundred at the rate of 7s. 9d. each delivered. These are 5 ft. 6 in. long, 2 ft. 3 in. wide, and very strongly made. They have been supplied to the Uffculme Open Air School, Birmingham, where they have given every satisfaction. Moreover, by the courtesy of the firm, I have been able to try one, and can vouch for its suitability.



A FOLDING BED.

It will be well to make preparations for rest before dinner; that is, the beds should be placed in position, and blankets given out if the weather is at all cool. Then it will be possible for the children to leave the dining tables and proceed to rest without any interval. Under such circumstances they will settle down to sleep much more readily.

Teachers beginning the work must guard against the temptation to use the resting shed too frequently. Rest should be out in the open whenever there is a reasonable chance that rain will not disturb until the resting period is over, and as a matter of fact after a little experience we shall be confirmed in our appreciation of the more exposed position. We must remember that in a closed room it is not the diminished amount of oxygen that is harmful or even the increased percentage of carbon dioxide ; it is the heat, moisture, and stagnation of the air that are injurious. Atmospheric conditions of this kind have a most baneful effect upon the metabolism of a child, while exposure to wind and cold promotes the rapid circulation of the blood, for more oxygen is taken in, the lungs are made to expand, and the appetite is rendered keener.

It is during the mid-day rest perhaps even more than at lesson time that one feels the advantage of trees. They give such welcome shade from the sun in hot weather, and at all times the light is subdued in a manner conducive to sleep.

Nobody expects *every* child to sleep the *whole* of the rest time, but the teacher must insist that for the whole time the children should lie quite still with eyes closed. The beds should be at least 2 ft. apart, then talking may be easily detected and stopped ; a further precaution is to guard against covering the face with the blanket.

Usually it is on days when there is a chilly wind blowing that children sleep most satisfactorily. On such occasions they make full use of their blankets, and readily make themselves snug and cosy. At the Uffculme Open Air School, Birmingham, woollen bonnets or caps, and mittens are provided for extra comfort in the cold weather, and it is not surprising to hear that " the majority of the children sleep all the time."

During rest time one teacher should be able to supervise any number of children not exceeding 150. There should be a rota for this duty, so that all members of the staff should in turn have the time free for lesson preparation, marking exercises, or rest.

There is only one point further with regard to the mid-day rest, it is that all blankets, bonnets, caps, and mittens should be labelled so that the children may know their own. With all our precautions it is unlikely that vermin may be absolutely excluded from the school. There are also possibilities of skin diseases, and to keep these unpleasant inflictions from spreading, the extra clothing mentioned should not be interchanged.

In residential schools arrangements must also be made for sleeping at night-time. In a small Open Air School at Deptford the shelter and beds used for the mid-day rest have also to serve at night, the only difference being that the children have extra bedding to make up for the loss of the day clothes. This is a very cheap arrangement, but it can hardly be regarded as satisfactory. Much more comfort is desirable and more protection should be available during very bad weather.

Suitable dormitory arrangements do not present a new problem, and one may say that for an Open Air School no special arrangements need be made beyond the provision of plenty of windows that can be opened wide.

The following are the Board of Education regulations regarding dormitories.

(*a*) The minimum width should be 16 ft., the minimum area should be 50 sq. ft. per child, and the minimum cubic capacity 500 cub. ft. per child. A separate bed must be provided for each child, with sufficient space between the beds. Cross ventilation must be provided where possible.

(*b*) Adequate means of supervision must be provided in a dormitory ; this may be secured by means of a window in the bedroom of the officer in charge. In houses, or homes, having small bedrooms, the officer's bedroom should be closely adjoining on the same floor.

(*c*) No boys over nine years of age should be lodged with girls, unless in a distinct wing approached by a separate staircase. Boys under nine years of age may be housed in the same buildings with girls, but must have separate dormitories. Each supervising officer should have a separate bedroom.

(*d*) Adequate provision should be made for storing clothing and household materials, and each child should have a locker or box wherein to keep his own property.

CHAPTER VI.

Medical Inspection and Treatment.

A QUALIFIED nurse is usually appointed to give her whole time to the Open Air School, while the doctor pays a weekly or fortnightly visit. The doctor selects suitable cases from among the applicants for admission, examines all the scholars periodically—say, three times a year—supervises the work of the nurse, gives advice on treatment of special cases, gives advice on the physical welfare of the scholars in general, and recommends suitable children for return to ordinary school. It is essential that doctor and head teacher should work together in a friendly manner ; mutual confidence between these two has always contributed largely to the happiness and success of the school.

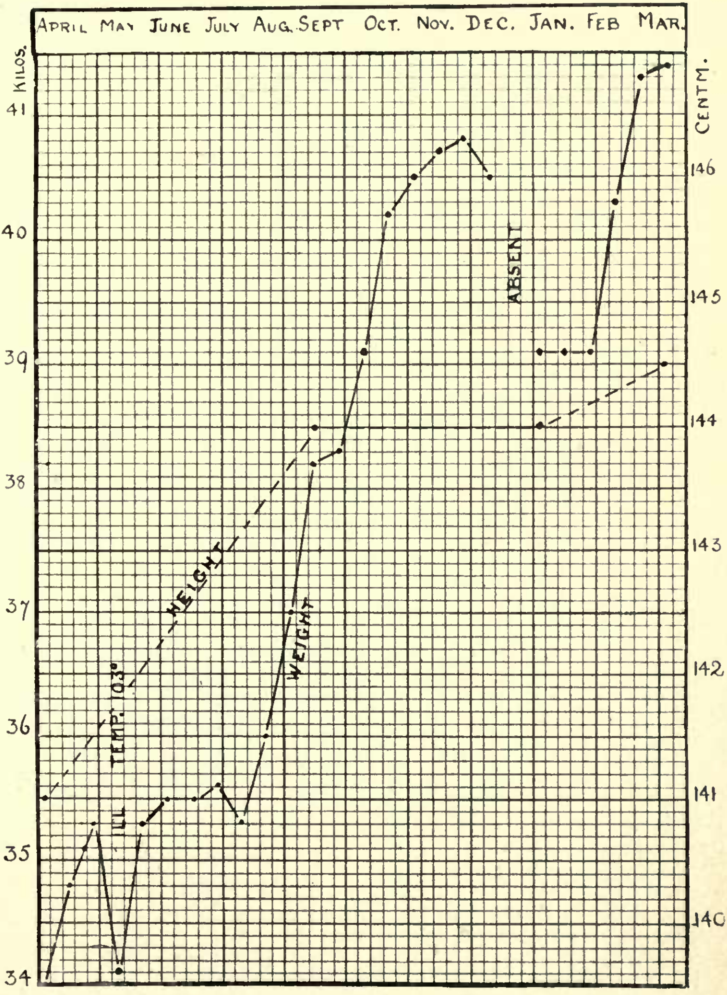
The nurse has many duties of which we can enumerate only the most important. She must have an intimate acquaintance with the physical condition of every scholar in order to be able to advise the teachers on necessary treatment in special cases. Sometimes it is advisable that a child should lie down and be relieved from lessons for a short period ; usually, the teacher can decide, but sometimes the children are unwilling to rest in this way, and make light of their indisposition ; others, of a lazier nature, are very fond of the rest, and if possible will prevail on the indulgence or credulity of the teacher in order to escape the mental effort of lesson time. In all these doubtful cases the nurse's knowledge is invaluable.

Many of the children have to take medicine, usually malt and cod liver oil ; the nurse looks after this, and also syringes discharging ears, applies lotion to bad eyes, dresses wounds, and so on.

The children should be weighed once a fortnight, while at less frequent intervals the heights and chests should be measured and the blood tested. Nurse assists the doctor with these duties, and afterwards charts and summarises the results, and selects the least satisfactory cases for inspection by the doctor at his next visit. The value of the weighing depends upon the regularity with which it is carried out. Under such circumstances it is possible to see at a glance whether steady progress is being made. During the usual school period (8 to 14 years) the average increase in weight for healthy children is about 9 oz. per month. The average for the children in Open Air Schools has been 12 ozs. per month, which may be regarded as a satisfactory standard. The chest expansion should average 2 in. per year. The simple blood tests are just colour tests, and serve to estimate the haemoglobin. In the blood of a normal healthy person the haemoglobin is spoken of as being 100 per cent. This is taken as a standard, and by comparison most of the children suitable for Open Air Schools have only 65–75 per cent. haemoglobin. The average rise in these schools has been 10–12 per cent. in a six months' period.

Further blood tests have been carried out by Dr. Hirsch (Medical Officer of the Shooter's Hill Open Air School), the object of which has been to estimate the resistance offered by the blood to infection by disease germs. This estimation is known as the Opsonic Index of the blood. The germs of tuberculosis were used for the purpose and the results of two tests at a six months' interval showed a remarkable average rise in the Opsonic Index. It may be inferred that if the open air treatment renders children more immune from tuberculosis germs, then there is a corresponding effect in the case of other diseases.

The summaries of these various estimations (weight, height, etc.) indicate the progress made by the school as a whole, and



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RECORD OF MEASUREMENTS OF WEIGHT AND HEIGHT
(L. W., AGED 13)

Haemoglobin.—April, 70 per cent.; September, 80 per cent.; January, 90 per cent.

it is interesting to note that the best results in this direction are obtainable during the winter months, in spite of the bad weather. It is probable that the tonic effect of the wind has something to do with this.

A very large proportion of the nurse's time is taken up in the bathroom. The bathing should not take the place of the weekly hot bath at home, but should be in addition to it, and serve simply as a tonic to the skin. For this reason the children should bathe every day if possible, or failing that, every other day—in mixed schools the boys and girls might use the bath-room alternately. When the bathing takes place frequently, soap is not necessary, just a spraying with tepid water, then vigorous rubbing with the towel; the whole operation can be got through in a very short time. When the skin is dirty, however, the process is a much longer one—really, slipper baths are necessary, but the spray baths may be used as follows—

The children strip and then take up a position in a line just in front of the spray rosettes; the nurse turns the water on and adjusts the temperature. When ready, she blows a whistle and each child steps forward into the shower. After a moment the water is turned off, each child steps back and proceeds to soap the limbs. The water is again turned on, the temperature is adjusted, and on the sound of the whistle each child steps into the shower. This is repeated twice, for the washing of the limbs is followed by the washing of the trunk (the children help each other to wash the back), and, finally, the face and neck are washed. During the last shower the temperature of the water should be gradually lowered until it is only lukewarm, to lessen the risk of chills. The children should assist each other to dry themselves properly, so that the nurse may give her whole attention to supervision.

Toothbrush drill should precede or immediately follow the bath, and if there are days when the children do not bathe, the cleansing of the teeth should not be omitted.

It will probably be an advantage if the nurse can do all the catering and supervise the kitchen workers, and the serving of the food; she will then get knowledge of the appetites of the children and be able to deal effectively with the dainty ones.

Like the rest of the staff of an Open Air School, the nurse must be fairly versatile; the nurse who is strictly professional (that is, one who disdains all work other than that included in her hospital practice) will not be a success. The power of organization, of controlling, of teaching, of undertaking clerical work and stocktaking, should be the possession of the Open Air School nurse. In a word, the nurse should have the gift of general adaptability.

BREATHING EXERCISES.

These form a part of the medical work for which the teachers may be responsible.

Unless it is actually raining the breathing exercises should be taken in the open air, and as often as possible—four times a day will not be too much. Breathing exercises should be taken for the following reasons—

(i) Many children have learned to breathe wrongly.

(ii) They improve the circulation of the blood—an acceleration of which results in the destruction of the germs of disease.

(iii) Like other parts of the body, the lungs need exercise.

(iv) They have a marked influence on the powers of speaking and singing.

Breathing exercises will give practice in breathing through the nose; they should keep the elastic tissue of the lungs in good condition, and especially should exercise the base of the lung. It should be remembered that the lungs are somewhat pear-shaped, and the tendency in ordinary breathing is to use only the upper and narrower portion—the lower and larger portion then becomes stagnant and prone to disease. The lower portion of the lung should be exercised frequently; this is known as deep breathing, or diaphragmatic breathing, since the lung not only expands laterally but downwards, so as to depress the diaphragm.

Breathing exercises should not be practised immediately after meals, nor for more than a few minutes at a time. The preparation for the exercises should include the loosening of any tight garments and the thorough use of the handkerchief.

1st Exercise.

Stand erect, hands on the lower part of the chest, mouth closed. Take slow, steady, even breath through the nose, do not raise collar-bone or shoulders. (This causes an expansion of the entire chest, the lower ribs move outwards and the diaphragm moves downwards.) After filling the lungs, allow the air to pass slowly out through the nose.

2nd Exercise.

Same as first in all details except that the air is sharply expelled through the mouth.

3rd Exercise.

Same as first in all details of inspirations. Emit the breath, singing *ah, oh, oo.*

4th Exercise.

Same as first in all details, except that each nostril is in turn closed, and the breath taken in and out through the other.

5th Exercise.

Standing in good position, the child raises the arms to the shoulder-level while breathing in, and lowers them again while breathing out.

6th Exercise.

Standing with the hands on the shoulders, the child bends the body forward from the hip joints, being careful to keep the back flat and the chest pressed forward. The position of the hands is calculated to counteract the drawing forward of the shoulders by contracted pectoral muscles ; the movement itself corrects kyphosis.

7th Exercise.

Raise the arms forward to the shoulder-level, then part them sideways, at the same time taking in a deep breath while the pectoral muscles are stretched and the chest expanded.

8th Exercise.

Standing with the hands down by the sides, the palms are turned forward ; while the shoulder joints are thus rotated outward, the head is pressed forward, and a deep breath taken in. During expiration the hands and head are returned to their normal position.

9th Exercise.

The children run at full speed to a previously chosen spot 10 or 15 yards away, then exercises 1 and 2 are taken very vigorously. Repeat by a rush to the original position. This is a splendid exercise for cold weather, and has a bracing effect on the whole of the system.

During the convalescent period after influenza and diphtheria children should not undertake vigorous exercises until they are certified by the doctor as free from tachycardia. At such a time the heart is likely to be irregular and any exertion may result in dilation or even heart failure.

A debilitated physical condition may find expression in spinal curvature. This is often so slight as to be almost unnoticeable, but nevertheless it should be corrected or it may get worse. Frequently no special care is necessary—the general curative features of the Open Air School process being sufficient to tone up the whole system and produce an erect carriage. As a matter of fact, the improvement in the bearing of the scholars is a very marked result of a stay in the Open Air School. Where spinal curvature is of a more obstinate and permanent nature special care is necessary, and the following remedial exercises are suggested. Since they include deep breathing they may be substituted for the breathing exercises given above, and while the teachers take the ordinary breathing exercises with the bulk of the scholars, the nurse may take charge of those requiring the special spinal exercises.

Spinal Exercises.

(i) Lying (flat upon the back with the arms and the palms of the hands pressed to the sides).

(*a*) Lifting both arms forward and upwards, while breathing in, and bringing them back again outwards and downwards to the sides while breathing out (six to eight times, slowly, in time with deep breathing).

(*b*) Standing (with the back from head to heels against some support, such as the door-post ; the arms pressed to the sides). Lifting both arms outwards and upwards while breathing in, and lowering them outwards and downwards while breathing out (six to eight times slowly, in time with deep breathing).

(ii) Standing (with the arms by the sides).

(*a*) Bending both forearms up, so that the fingers slightly bent touch the outer part of the shoulders, and from that position extending both arms outwards (the palms turned down), then bringing them into the bent position, and from there down to the sides again (two to six times ; each movement quickly, but stopping in the different positions).

(*b*) Same exercise but extending the arms upwards.

(iii) Hanging (from a bar, trapeze, or similar support, with the hands kept as far apart as the width between the shoulders). Parting and closing the legs with the knees kept straight (two to six times; repeat the whole exercise two or three times).

(iv) Standing (with the back resting against a door-post, the arms hanging perfectly loose by the sides, the feet parted and placed some few inches forward from the post). Bending the body forwards and downwards with the head and arms drooping down; then raising it up gradually, so that each vertebra of the spine in turn, from below upwards, may, if possible, touch the door-post (two to four times; repeat twice).

(v) Lying (flat on the face with the arms and the palms pressed to the sides). Raising the upper part of the body a short distance only, but with the shoulders well drawn back (two to four times).

(vi) Sitting (astride a chair with the hands bent up to the shoulders, the elbows kept close to the sides and the forearms brought well outwards). Twisting of the body from side to side (two to six times each side).

(vii) The most important movement for a faulty carriage of the head (stooping, or poking the chin forward) is bending the head slowly backwards and raising it again by drawing in the chin (four to eight times). The effect might be increased by someone offering resistance to the movement with a hand placed behind the neck. In either case it is essential that the movement takes place not merely between the atlas and the occiput, but throughout the whole of the cervical vertebrae.

(viii) Sitting (facing a wall, some 2 or 3 ft. distant from it, with the arms extended upwards). Leaning the body forwards from the hip joints, with the spine kept straight, until the hands touch the wall at the highest possible point (four to eight times).

(ix) Sitting (astride a chair with the left hand behind the neck and the right arm hanging down by the side). Bending the body to the right side and raising it to the upright position again (six to ten times).

(x) Lying (on the left side) with the left hand behind the neck and the right arm extended along its own side of the body. Raising the upper part of the body straight towards the right side (three to six times).

(xi) Hanging (from a bar), bringing both legs over to the left side, and keeping them there for a few seconds (three to six times; repeat twice).

(xii) Standing (with the left foot two foot-lengths in front of the other; the left side resting against the edge of a table or similar support, placed at the level between the iliac crest and the trochanter). Bending the body over to the left side (six to twelve times).

(xiii) Lying (flat on the face), while the legs are grasped and brought over to the left side by the operator, who at the same time with his other (left) hand placed on the height of the convexity, steadies the patient's body and localises the movement to the desired part of the spine.

PART II. CURRICULUM.

CHAPTER I.

Time Table. Weather Study.

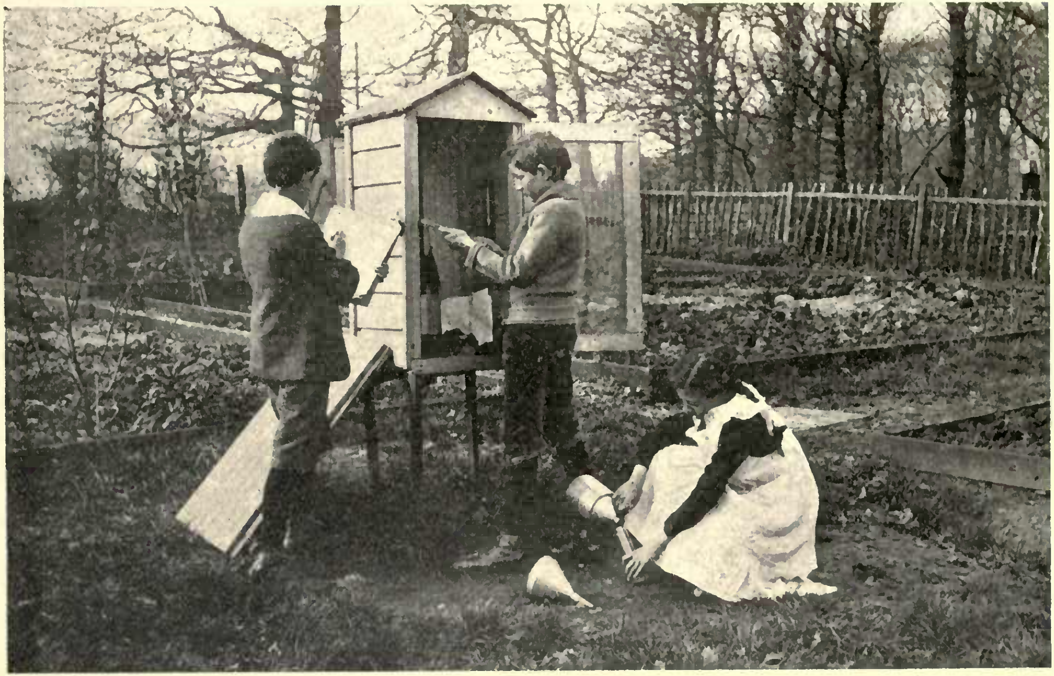
THE Open Air School is to be regarded as a compromise between the doctor and the educationist. Thus it is that the teacher has to arrange his instruction to obviate any possible mental strain on the scholars. This is accomplished as follows—

1. The reduction of the number of hours of formal teaching per day, but partly compensating this by working during ordinary school holidays.
2. The reduction of the size of the class, thus ensuring much happier conditions.
3. The abandonment of some of the mere memory ballast of the ordinary curriculum.
4. The combination of the instruction to be given with physical activity so that body and mind may be improved together.

All the usual school subjects may be dealt with, but always in as practical a manner as possible. Manual methods are adopted in all lessons, not only for the sake of education through hand and eye, but also that the exercise may conduce to bodily health. In cold weather, lessons of this kind may be given right out in the open with much less risk of chill than is incurred by those who learn in warm classrooms before being turned out into cold streets. Education of this kind develops the constructive talent, and is therefore doubly valuable to children of the type under consideration. It gives them a taste for making things and especially for making things in the open air. They learn to appreciate the outdoor life, for has it not meant to them health and vigour in place of weakness and lassitude? Besides having regained their health while at school, they have learnt how to keep their health, and to keep it in a very pleasant way. The preparation for an outdoor life is an aim worthy of consideration by every teacher of physically debilitated children. Before considering this in detail let us turn to the construction of the time table.

In time-table building the teacher will meet with two unusual difficulties: firstly, the Board of Education regulation that six hours per week must be given to definite manual training; and, secondly, provision must be made for the daily rest-time of two hours if possible, or at any rate for something approaching two hours. The specimen time table shown is the one in operation at the London County Council Open Air School, Shooter's Hill, S.E., with only slight alterations apart from the cutting out of the Saturday lessons, as Saturday should be a free day. In a residential school it would probably be best to set apart Wednesday afternoon for games in exchange for Saturday morning, and also to have the daily bath before breakfast or after tea instead of at mid-day. The time given to the several subjects is as follows—

		Religious Instruction	100	minutes
		Arithmetic . . .	140	,,
		Nature Study . .	60	,,
		Drawing . . .	105	,,
		Geography . .	60	,,
		History . . .	30	,,
		Reading . . .	120	,,
		Poetry . . .	30	,,
		Composition . .	30	,,
		Dictation . . .	45	,,
		Gardening . . .	45	,,
		Modelling . . .	35	,,
		Class Talks . .	50	,,
GIRLS:	*Sections I and II* .	Needlework . .	180	,,
BOYS:	*Sections I and II* .	Carpentry . .	90	,,
		Gardening . . .	90	,,
	Section III .	Cardboard and Strip Woodwork .	180	,,



Photograph by *A. G. Williamson.*

THE WEATHER BUREAU.

The class talks deal with current events, weather records and forecasts, natural history " finds," and so on, giving opportunities for the development of powers of expression in rather a better way than by having a set lesson for the purpose once a week. The topics of conversation suggest themselves ; hence the talk is more natural and less forced.

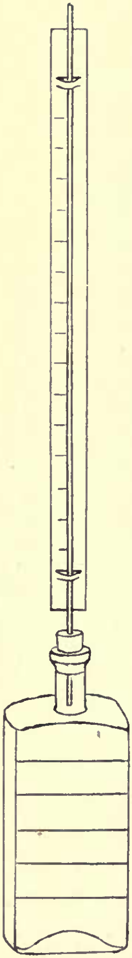
It may be well in this chapter to give an account of the weather study, which will so often be the subject of these daily class talks. In the lower classes no instruments will be required except, possibly, a thermometer. It will be sufficient for them to make use of lessons on the points of the compass to note the direction of the wind, and the general weather conditions may be described in a simple way. The clouds may be classified into feather-clouds (*cirrus*), heaped-up clouds (*cumulus*), and rain-clouds (*nimbus*). A weather record might be kept for one term during the year (experience has shown that little children lose any intelligent interest in the record if it is kept on all the year round), and used to find out how to forecast the weather by noting the direction of the wind and the appearance of the sky. The varying shadows cast by the sun should be noted at another period, and also the explanation of the movements of the swallow or martin. Later on one may deal with the exact determination of temperature, and may construct a simple thermometer from a medicine bottle full of coloured water, with a cork through which passes a piece of glass tubing. A paper scale may be fixed to the tube, and note taken of the effect of transferring this water thermometer from a bowl of cold water into warm sunshine. Subsequently the coloured water may be poured away except for one drop retained in the glass tube, and then note the effect of holding the bottle clasped in warm hands. The movements of the drop of water in the tube will render the explanation of the mercurial thermometer very easy. Thence may follow daily thermometer readings and

TIME

	9.0	9.35	9.55	10.5	10.40	10.55	11.25
Monday	Breakfast	Assembly for Prayers Scripture or Hymns	Class Talks	Arithmetic	Recreation	Nature Study	Breathing Exercises
Tuesday				Modelling		Geography	
Wednesday				Arithmetic		History	
Thursday				Arithmetic		Nature Study	
Friday				Arithmetic		Geography	

TABLE.

11.30	12.0	12.45	1.30	3.15	3.30	4.15	5.0	5.30
Drawing	Prepare beds for mid-day rest Personal Hygiene	Dinner	Rest	Recreation	I. Gardening II. Reading III. & IV.: Singing	Reading Gardening Reading	Pack-up apparatus Assembly for prayers	Tea. Dismissal at 6 p.m.
Reading					*Girls*—Needlework *Boys*— I. Carpentry II. Gardening III. Cardboard Work			
Poetry					Drawing	Dictation		
Drawing					I. & II.: Singing III. Gardening IV. Reading	Reading Reading Gardening		
Composition					*Girls*—Needlework *Boys*— I. Gardening II. Carpentry III. Cardboard Work			

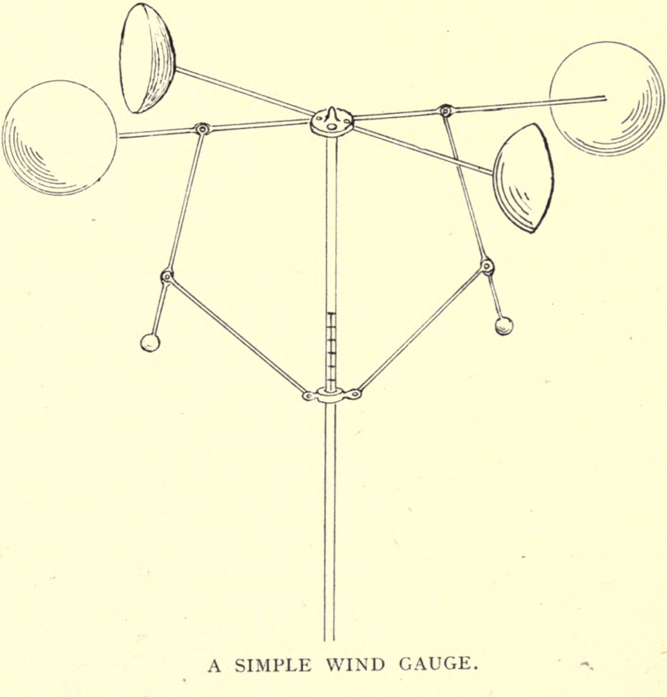


A WATER THERMOMETER.

their use to determine when rugs and fires are required, and what temperatures are necessary for the germination of various seeds, for the ripening of tomatoes in the garden, and so on.

Various forms of hygroscopes may be studied next, and a simple one to begin with is a piece of seaweed. The condition of this should be ascertained daily for a short period, and the effect of rise of temperature and variation in the wind noted. This will be an additional aid to weather forecasting, and will help to determine suitable times for such gardening operations as watering and transplanting. Other simple hygroscopes include a piece of cord about a yard long, stretched between two nails driven into the wall or a length of board. The cord tightens up when the air is damp, but hangs loose in dry air. Then a fir cone opens and closes its scales as the air varies from dry to wet ; a compound lath (made of a strip of hard wood such as teak, about 18 in. long, $\frac{1}{2}$ in. wide, $\frac{1}{10}$ in. thick, fastened to a similar strip of light wood such as bass or pine) curves one way when the air is moist, and the other when it is very dry. A very effective hygroscope is obtained by soaking blotting paper or a piece of muslin in a solution of cobalt chloride. This will be blue when dry, but pink when moist. The children may make on cartridge paper a pencil sketch of a girl, and paint her frock with the cobalt chloride solution. The girl will appear to have a blue dress on dry, warm days, but a pink dress at other times.

One could go on to suggest other contrivances which show variations in the humidity of the air. Let it suffice to say a word about the wet and dry-bulb thermometers. Usually these are supplied mounted together on a boxwood scale, and beneath them is a little receptacle for water, from which a piece of lamp wick passes to the bulb of one thermometer. It is a neat and convenient piece of apparatus, but one which is difficult to explain to the average boy or girl of twelve or thirteen years of age.

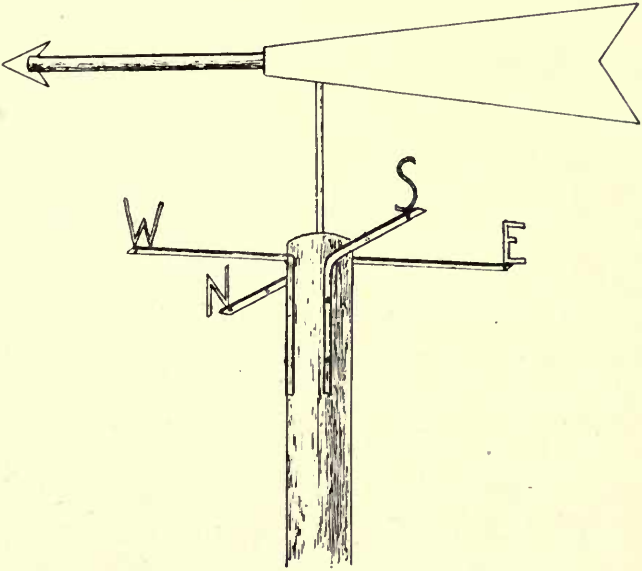


A SIMPLE WIND GAUGE.

For teaching purposes it is a good plan to take two ordinary cheap thermometers, making quite sure that the readings agree. To one tie a little bottle or test tube, fill it with water, wrap a piece of muslin round the bulb of the thermometer, and let one end of the muslin hang down into the water. After a short time compare the readings of the thermometers, and the class will probably be surprised that now they do not agree. Having seen the wet-bulb thermometer made, the children will readily see that it is the evaporation of the water on the muslin that causes the wet-bulb thermometer to register a lower temperature than the dry-bulb thermometer, and they will observe further that the difference in the temperatures registered will depend upon the rate of evaporation, that is, upon the amount of moisture in the air.

Having mastered the principle of the hygroscope, the next step will be to take more careful observations of the winds. A beginning has already been made, but now not only must the direction of the wind be noted but also its force, the temperature, the humidity, and the rainfall. The rate at which the wind travels may be got exactly by means of an anemometer, but the standard form is expensive to buy, very difficult to make, and certainly difficult to explain.

It is probable that for our purpose a simpler form of instrument will be better, and especially one that can be made in the school. We have made one which is very satisfactory—it cannot be called an anemometer, for it does not register the rate of the wind, but only helps one to decide whether the wind should be described as gale, strong, moderate, or light, for opinions on this point vary very much. This wind gauge is made for the most part of the steel tube of an umbrella, a few spokes from a bicycle wheel, and four of cook's patty pans, or, better still, two copper balls of a lavatory cistern cut in halves to make four hemispherical cups. Each of the latter is soldered to the end of a spoke, and the four spokes are then screwed crosswise into a brass hub, which works easily on the steel tube. If the tube is held upright in the wind, the spokes rotate like a child's windmill; the rate of rotation will depend upon the force of the wind. Now apply the principle of the "governor" on the valve of a locomotive, and by means of wires attached to two opposite spokes and to a collar on the tube, make the height of the collar dependent on the rate of rotation of the cups. The path traversed by the collar may be graduated by file marks on the tube. The highest mark may indicate gale, the next high wind, the next brisk wind, the next moderate, then light wind. At the bottom of the scale a mark may represent calm, for the collar will be stationary. The great point to remember in the

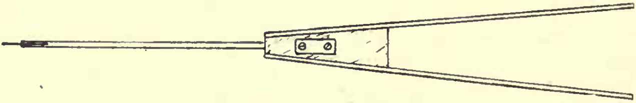


A SIMPLE WEATHERCOCK.

construction of this instrument is that everything except the central axis has to revolve, and therefore the cups, wires, and collar should be as light as possible.

LETTERS TO MARK POINTS
OF COMPASS.

Another appliance which gives scope for manual dexterity is a weather vane. Again, the steel tube of an umbrella answers splendidly for the central axis. The hub may be a piece of wood, wedge-shaped in plan, and having a hole through the centre for the axis to pass. The top of this hole should be closed with a small piece of brass, and a good bearing is obtained by putting a steel ball from a bicycle in the hole between the top of the axis and the piece of brass. The block of wood should now turn on the axis with very little friction, especially if the steel ball is coated with vaseline. An arrow head has to be fixed to the narrow end of the wedge, and a wing on each side projecting beyond the broad end. The arrow head must offer as little resistance to the wind as possible, and thus should be small and rounded; the wings must offer as great a resistance to the wind as possible, and therefore should be large and flat. Further, the weight of the arrow

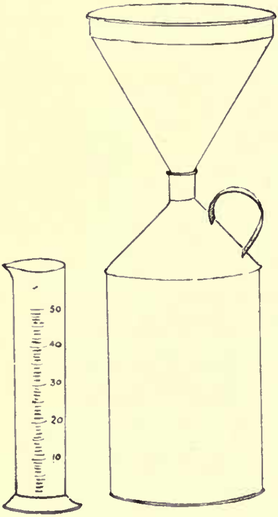


PLAN OF UPPER PART OF WEATHERCOCK.

must balance that of the wings, so that these must be as light as possible. They may be made of very thin wood, or, better still, of sheet zinc. The arrow may be made of solid metal rod, beaten out at the end, or may be of wood tipped with a triangular piece of sheet lead. The axis should then be driven into the top of a pole such as a flagstaff. The wind vane is completed by marking the points of the compass. Take four galvanised iron brackets such as are used for supporting shelves, screw them to the pole to form a cross, and fix the letters N, S, E, W, into the holes in the horizontal arms. The letters may be cut out of wood, but will be much better if of brass $\frac{1}{16}$ in. in thickness. Sheet brass of this thickness is useful for numberless articles that may be made in the school; it may be cut with a cold chisel, and then filed up exactly to shape. The vane will be ready for use when the pole is fixed in the ground in such a position that the directions indicated by the letters are correct.

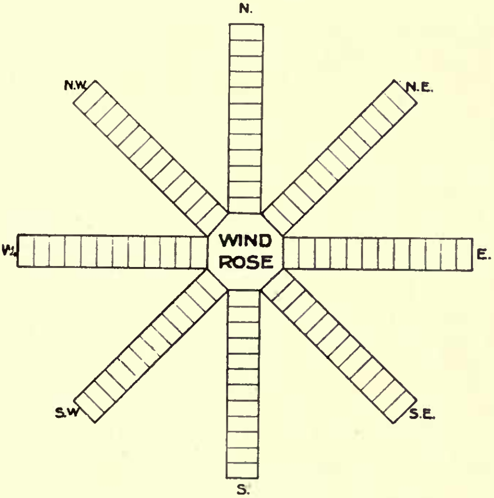
Following up the observations on the direction and force of the wind, it is well to determine whether there is any relationship between wind and rainfall. For this a rain gauge is necessary; again where method and understanding are to be considered before accuracy, a home-made instrument, though perhaps slightly faulty, is preferable to a more perfect one supplied ready made. The requirements in this case are a quart oil-can, a funnel, and a graduated glass cylinder.

A funnel of 5 in. in diameter is of a convenient size, although larger ones are used for the Meteorological Office, and if both funnel and can are greased with vaseline they will not rust. The graduated cylinder presents a little more difficulty. In many schools there are suitable cylinders graduated in cubic centimetres or pints; for a 5 in. funnel an inch of rain will occupy 322 c. cm. A paper scale may be stuck on to such a jar, and 1 inch marked opposite to 322 c. cm.; then the tenth-of-an-inch mark will be opposite 32·2 c. cm., and by proceeding in this way the new scale may be made. If the jar is graduated in pints, then again for a 5-in. funnel 1 pint of rain will represent a fall of 1·8 in. A strip of paper may be stuck on the outside of the jar, and a line put across it opposite the pint mark ; then if the distance from the bottom to this line be divided in eighteen equal parts, each division will represent $\frac{1}{10}$ in. of rain. Finally, if only an ungraduated cylinder is obtainable, such as a gas jar or a calf's-foot jelly jar, then a pint of water may be poured into it, and the height of the water divided into eighteen equal parts as above to get tenths of an inch of rainfall, or, better still, if the children know something of areas and volumes, let them compare the diameter of the funnel with the diameter of the cylinder ; 1 in. of rain falling into the funnel will occupy 2·5 × 2·5 × 3·14 cub. in. = 19·625 cub. in. Now calculate the height in the cylinder of 19·625 cub. in. of water. That height will represent 1 in. of rainfall ; the division into tenths and hundredths will be quite a simple matter. The rain-gauge should be placed in an unsheltered position, the distance from the nearest building being at least equal to the height of the building, and it is better that the buildings should be to the north of the rain-gauge, as the most rain falls when the wind is in some southerly direction.



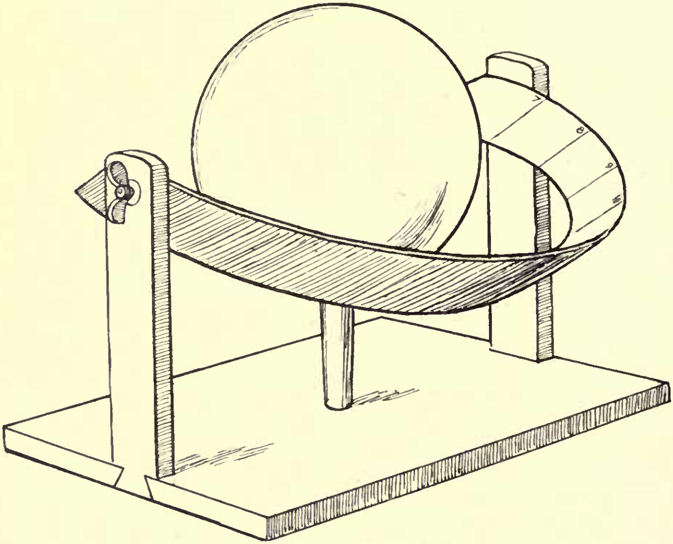
A RAIN GAUGE.

The last requirement for our wind study is a suitable chart for recording the observations made. Many are in use, but none are better than that known as the "Wind Rose," of which an illustration is given. The eight arms are divided up into sections representing days, and on any particular day the direction of the wind is first ascertained, for it determines the arm on which the day's observations are to be recorded. The date, temperature, force of wind, and rainfall should all be indicated, later on the number of hours of sunshine should also be noted. The prevailing wind for the period the chart covers can be seen at a glance, for that arm will be filled up first; closer inspection will reveal the sort of weather which each wind has brought. Frequent references to the Wind Rose will be found very useful in the geography lessons.



A WIND ROSE.

A Campbell-Stokes Sunshine Recorder is a very expensive instrument, but a working model on the same principle is easily within the powers of the average boy. Everyone knows that a lens may be used to focus the sun's rays sufficient to scorch a piece of paper, and, further, that to do this the paper must be held at a fixed distance—the focal distance—away from the lens. In a simple sunshine recorder the lens consists of a spherical flask of water. A suitable flask may be obtained at any dealers in poultry appliances, as it forms the main portion of the usual drinking fountain for chicks.



A SIMPLE SUNSHINE RECORDER.

A drop of hydrochloric acid in the water will prevent algoid growths, and the deposition of chalk, so that both glass and water will always be quite clear. The flask should be tightly corked and inverted in the stand. Two uprights support a brass arc at the focal distance from the lens ; this arc is pivoted to the supports, so that it may be raised or lowered according to the season of the year, being lowest at midsummer when the sun is high, and gradually raised from that time to midwinter. A similar arc, but flattened, is used as a template for cutting arcs of ordinary brown paper upon which the records are to be made. Each morning a paper is clipped to the brass arc, and as the sun shines a line is scorched along the paper. A passing cloud breaks the continuity of the line, so that the gaps in the line represent the cloudy periods. By trial find out how long the line will be for one hour's sunshine, then the paper may be divided up to represent hours, and at the end of each day the number of hours of sunshine may be easily ascertained, and also the times of the cloudy periods.

A maximum and a minimum thermometer will be useful, also a soil thermometer ; and the inevitable barometer, the construction of which will present no difficulty, provided that both tube and mercury are perfectly clean. All instruments which need protection from the weather may be housed in an adaptation of a Stevenson screen—elongated, so as to accommodate the barometer.

CHAPTER II.

Arithmetic.

Of all the subjects of the Open Air School curriculum, none should give the teacher greater pleasure than arithmetic, and for this reason—most of the children are very backward on entering the school, but various circumstances combine to ensure rapid progress in the majority of cases, to the intense gratification of the teacher. These are the days when practical methods are extolled to the skies, and for children of the type under consideration they are doubly valuable; moreover the conditions in the Open Air School are usually much more favourable for practical arithmetic than those which usually obtain in the in-door schools, and, further, the method is the only one which will appeal to the listless child.

Let us insist, however, that the practical method has only to break the ice as it were, and, this accomplished, other methods are to be employed if the progress is to be at all rapid. I believe it is a good thing to follow up the practical problem with others similar to it, but much more abstract in character, and always I would endeavour to find time for the frequent repetition of the arithmetical tables, provided that first of all by practical methods the children are made to understand thoroughly what they repeat.

Originality is not claimed for the following suggestions; several of the methods are described in detail in *In the Open Air*, by J. Eaton Feasey; some are from other sources, but all of them we have tried, and tried successfully.

With the very little children it is more difficult to suggest distinctly open air methods than it is with the older ones, but in simple number teaching it is obvious that one can supplement the use of dots and match sticks with twigs, leaves, acorns, hips and haws. It is a good exercise for the little ones to collect twigs, cut them into equal lengths, then to make up the bundles of ten. Matchboxes may be used to hold ten acorns each, and in the analysis of numbers these are of much use—for instance, the children may be asked to make little sums like 5 acorns + 3 acorns = 8 acorns, the signs being used, but not the terms plus, minus, and equal. The larger numbers like 27 are split up into two boxes of 10 acorns and 7 odd acorns, or 2 tens and 7 units. The twigs may be used also like Tillick's bricks to teach, for instance, that number 9 may not only represent nine separate things, but also one thing which is nine times as big as another; and again the actual measuring of the twigs and cutting up into correct lengths is a splendid occupation. The twigs may be used again in toy-making, such as the construction of a table with the lid of a chalk box and four sticks, thus introducing ruler work.

A good method, practised in many ordinary schools, but on account of the greater freedom even more applicable to the Open Air School, is that of calling out ten children in front of the class, and then allowing the others in turn to marshal them into groups to show the components of ten. By such methods as these all the first four rules may be taught in a practical manner, as well as the use of a ruler, and, finally, the simpler weights and measures like pounds and pints.

Garden produce is continually of service in the arithmetic lessons, especially in imaginary shopping. It is so much more real for a child to buy beans and potatoes than penholders and exercise books, whilst the fitting up of a shop as a fruiterer's and greengrocer's is a comparatively easy matter. The exercises will include pounds and pecks, scores and dozens, besides shillings and pence. Later on, the garden will provide examples in percentages, profit and loss, and simple book-keeping.

It is in teaching that branch of mathematics known as mensuration that the Open Air School provides the greatest facilities. The units of length and area are marked on the ground, and in this way each child proves for himself that there are 3 ft. in a yard, 9 sq. ft. in a square yard, and so on, with both English and Metric System units. Exercises are given in the estimation of distances by inspection, then verifying by exact measurement. Measurement of length by pacing is very useful, and what we call " hoop arithmetic " is at any rate popular—the children are asked to bring their hoops to school, each ties a piece of tape on to the hoop just as a distinguishing mark, then measures the circumference. The hoop is bowled along the line to be measured, and while doing so the child counts the number of revolutions. The circumference multiplied by the number of revolutions gives the distance covered. Variety is introduced by using a wheelbarrow or hand-cart, and the method leads on to the explanation of the cyclometer and taximeter.

Since one object of the child's attendance at the Open Air School is that he may become big and strong, the measurement of chest and height periodically is of special interest, and introduces the use of graphs. This at once opens up a wide field—one can measure the distance a snail crawls in successive minutes, and plot a curve showing distance against time ; one can measure the height of a plant week by week, and plot height against time ; one can measure the distance between two towns on a map, use the scale of miles to get the actual distance, then estimate fares and freights, and plot curves to show the relationship between fares or freights and distances.

The dividing up of the garden plots for various crops will serve to introduce the subject of fractions.

Exercises involving addition, subtraction, multiplication, and division of fractions, may be worked out by drawing lines and rectangles on the ground ; also by measuring out quantities of sand or soil. Proceed to similar exercises worked by paper folding and cutting, thence to drawing on squared paper, and, finally, to calculations in the usual arithmetical form.

Ideas of decimals may be given by actually drawing on the ground to represent, say, 33·3 sq. ft., taking three groups of 10 sq. ft., then 3 sq. ft., and $\frac{3}{10}$ sq. ft., going on to explain how these are usually written down and how the decimal point is used.

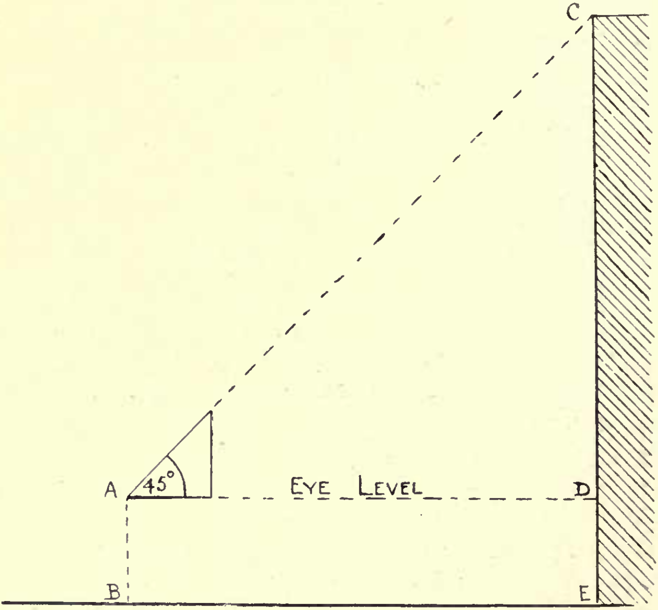
All the rules for calculating the areas of squares, rectangles, parallelograms, triangles, circles, may be well shown by drawing large figures on the ground, and the bole of a tree will serve to show the relationship between the circumference and the diameter of a circle.

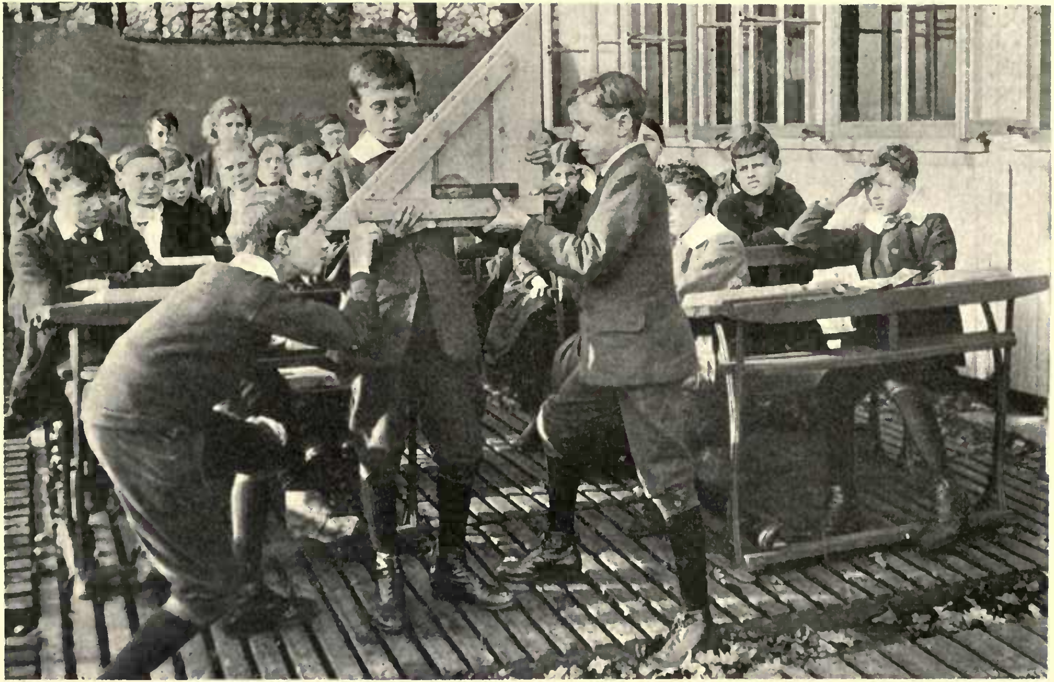
Very good demonstrations of those exercises dealing with carpets and linoleum may be given by using rolls of wallpaper. Since the pattern may be disregarded, these are easy to obtain, either from the homes of the scholars or from house decorators who will frequently give odd pieces away. They may be cut up into lengths, and in imagination floors may be covered with carpet, ceilings and walls papered, and all sorts of estimates made with regard to areas and costs.

The measurement of shadows gives scope for exercises in proportion—by comparing the length of the shadow of a tree with that of a yard stick one may calculate the height of tree. I well remember being at the top of a tower with a class of boys and a Government Inspector ; we measured the height of the tower directly by means of a surveyor's tape, and then the boys were told to go down and calculate the height from the shadow measurement. There was a narrow winding staircase, and the boys went down first. You may judge of the surprise of both the inspector and myself to find on reaching the ground that some of the scholars had not only made the necessary measurements, but also had finished the working.

It was a remarkable proof of the accuracy of the method, and also the rapidity with which it may be used.

The practice of surveying is dependent on the ability to measure angles. As soon as the scholars understand the use of set square and protractor, one may proceed to take observations in the field. The best instrument to start with is the 45° set square, and with it we may proceed to measure the height of the classroom. Each scholar holds the set square so that one of the shorter sides is horizontal, and then adjusts his position until the hypotenuse points to the top of the wall. The horizontal distance (BE) from the base of the wall will now be equal to the height (CD) of the top of the wall above the eye-level. Measure the distance (AB) from

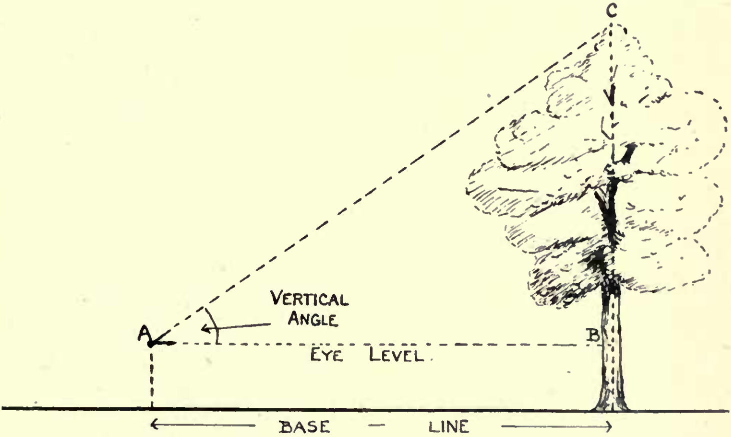




Photograph by *A. C. Williamson.*

USING A SET SQUARE TO OBTAIN HEIGHT OF CLASSROOM.

the ground to the eye-level, add this to the distance (BE) from the observer to the wall, and so obtain the height (CE) of the wall. In this case a right-angled isosceles triangle ACD is formed by a vertical from the top of the room, a horizontal at the eye-level, and a line joining the eye and the top of the room. The angle CAD between the base and the hypotenuse of such a triangle is called the "vertical angle," and always when using this set square the observer must move until the vertical angle is one of 45°. That is, in the use of the set square the angle is constant while the base line varies.

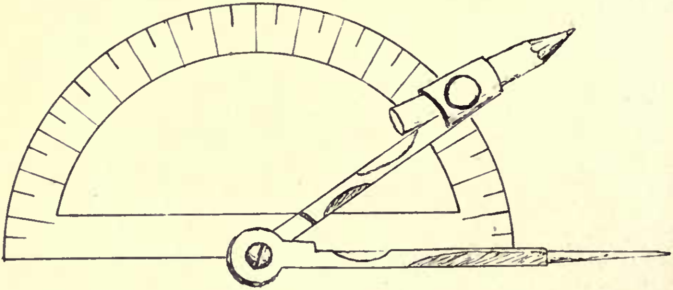


THE USE OF A PAIR OF COMPASSES IN FINDING THE HEIGHT OF A TREE.

In some cases there is an obstruction such as a wall, and the observer cannot move to a position suitable for the use of the set square, and if such an imaginary triangle is to be formed as before it cannot be an isosceles triangle ; the vertical angle must vary, but the length of the base line may be regarded as constant. In such a case the scholars have suggested the use of an ordinary pair of compasses instead of the set square.

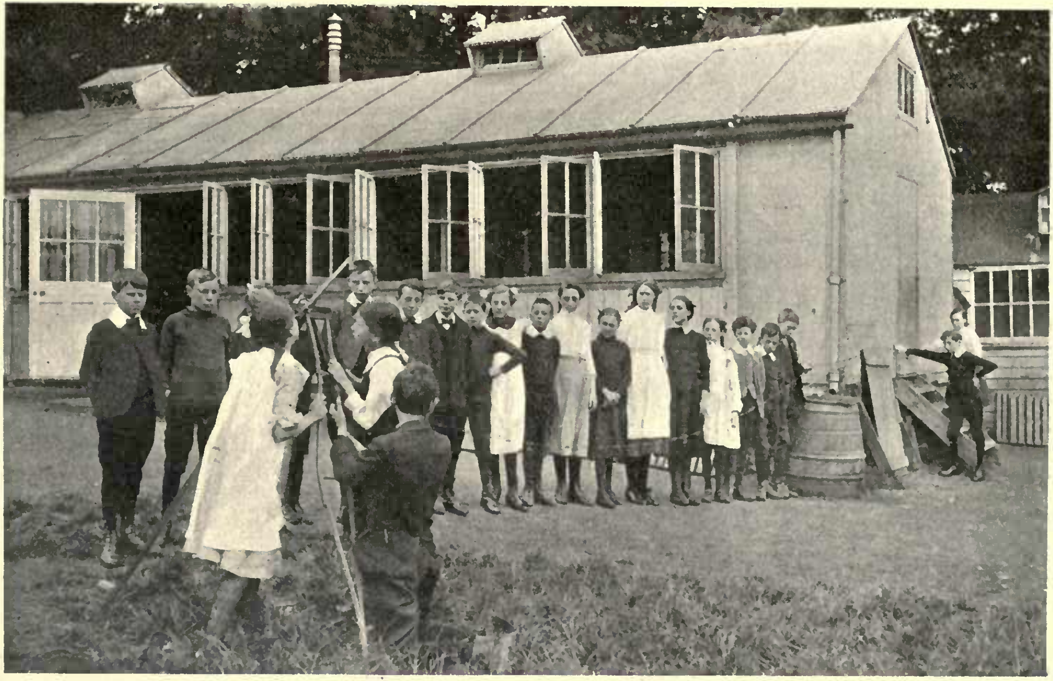
PUBLIC LIBRARY OF NEW SOUTH WALES

The observer stands in the most convenient position, holds the compass so that one arm of it is horizontal at the eye-level, while the other one is pointed to the top of a tree (say). The next step is to place the compass on a protractor in order to measure the angle between the two arms. For the imaginary triangle we know now the length of the base AB, and the magnitude of the two base angles CAB and CBA (one of them is a right angle), and the triangle can be drawn full size on the ground. The height of the triangle is the height of the tree above eye-level, and so the total height of the tree may readily be obtained.



THE COMPASSES PLACED ON A PROTRACTOR TO FIND THE ANGLE BETWEEN THE ARMS.

This method of using the compass and protractor has suggested to me the construction of a simple instrument known as the Model Theodolite. It is intended for those teachers who wish to make practical use of lessons on angles. With it scholars find the measurement of the heights of trees, buildings, and hills, or the widths of rivers, to be delightfully simple and extremely interesting. In junior classes all that is required to get accurate results is the ability to draw a triangle to scale, having given the length of one side and the magnitudes of two angles. In senior classes trigonometrical

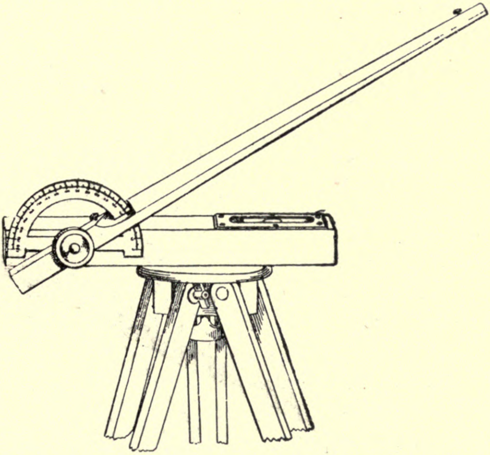


Photograp'i by *A. G. Williamson.*

FINDING THE HEIGHT OF THE BUNGALOW BY MEANS OF THE THEODOLITE.

calculations may be made to obtain the same results. The Model Theodolite combines accuracy with extreme simplicity.

Further exercises in surveying may involve the use of clinometer, plane table, sighting ruler, and ranging poles, but sufficient has been given to indicate methods appropriate to an Open Air School. In conclusion, let me emphasize the need of following up each practical exercise with several others of the same form, but giving abstract numbers instead of those actually obtained by measuring. Only in this way may real progress be made.



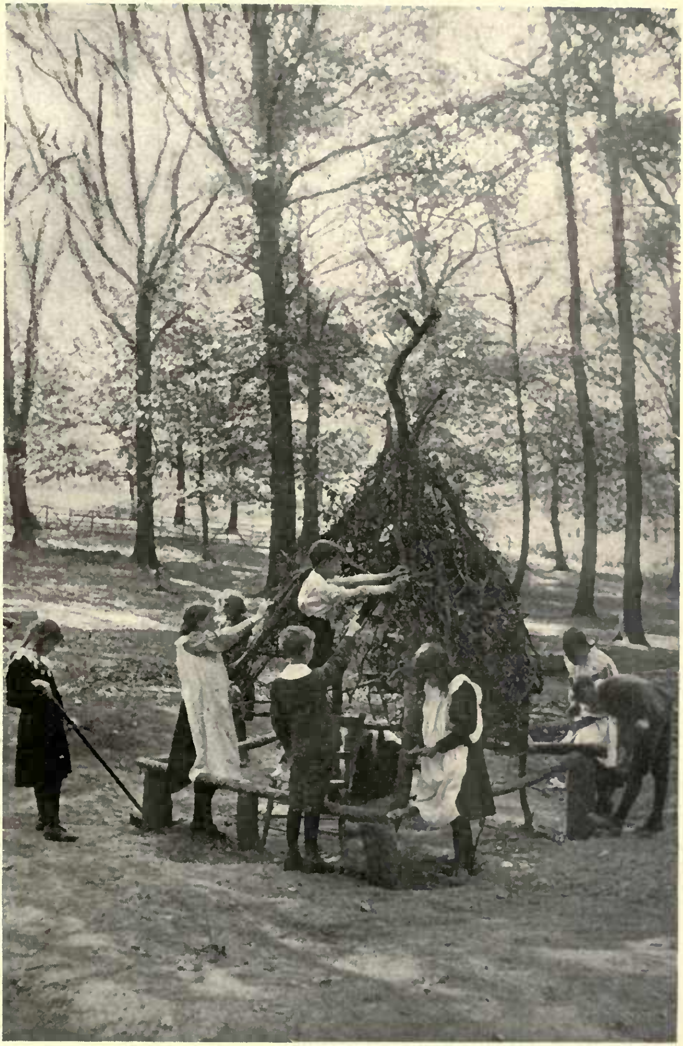
THE MODEL THEODOLITE.
(To be obtained of Messrs. George Philip & Son, Ltd., 32 Fleet Street, E.C.)

CHAPTER III.

History and Geography.

THESE two subjects may be dealt with together since the methods of teaching may be very similar. It is a good plan to make use of the immediate neighbourhood of the school as a starting-point in each case. One can seek to find answers to the questions—When was the town started ? Who were the first to live in it ? Why did they choose this situation ? Why did the town grow ? Let me illustrate the form of argument by reference to Woolwich. The name is from the Anglo-Saxon *Wulewic* and means the "hill reach." The place was old in Saxon times and, probably, it was originally British—the finding of many British and Roman remains in the vicinity supports this view, and the scholars ar taken to see some of these remains. The oldest part of the town is on a hillock close by the river, and this suggests that the first inhabitants were fishermen who chose this hillock as a suitable landing-place, since all around was marsh land. Some of the fish was sold to London residents, since already London was a place of some importance, and as the capital grew, so there was a greater demand for fish. The old village grew to accommodate an increasing number of fishermen and others who undertook farming and other occupations to supply the needs of the neighbourhood.

A further stage in the expansion of the village occurred when sand was substituted for rushes as a floor covering, for Woolwich has extensive beds of sand. Homes had to be found for the sand-diggers and sand-sellers. Later still guns were introduced in warfare, and it became necessary for England to produce these weapons. Woolwich was selected as the most suitable place for the making of guns, as they



Photograph by *A. G. Williamson.*

A LAKE DWELLING.

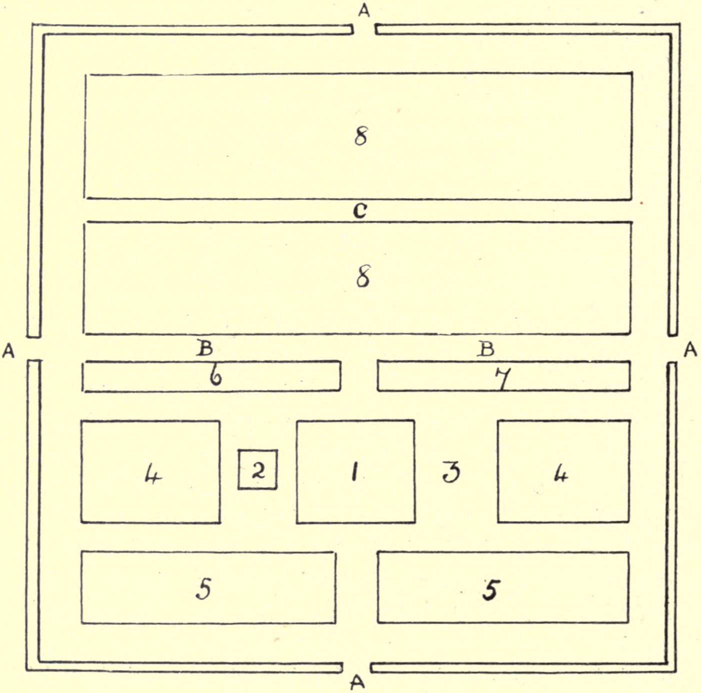
were cast in sand moulds, and Woolwich sand was of excellent quality for moulding purposes. Moreover, the proximity to the river and to London were other reasons why this should be chosen as the site of the national arsenal.

Docks were made in order that ships might be built, then equipped with guns and fitted ready for war in the locality of the arsenal, and successive wars have made the town grow to the present size.

Such an argument includes both history and geography, and many lessons are required for working it out, including the time necessary for visiting the places mentioned.

In order to give a clear idea of the conditions controlling the lives of the people, models may be made to illustrate their homes in different periods. Thus, in earliest times there were the cave, the lake-dwelling, and the hut rudely fashioned of branches of trees covered with turf ; one proceeds to the use of rough-hewn logs, sawn timber, stone, sun-dried bricks, baked bricks, and, finally, to the use of roof tiles. The models should be made of fair size, somewhat approaching full size where possible in order to afford opportunities for bodily exercise for the whole class, as well as practice in manual dexterity.

Having completed the reproduction of the ancient British homes mentioned above, we may proceed to the construction of a Roman Camp, thus to contrast the methods of the victors and the vanquished. In the building of their camp the Roman soldiers followed a regular plan ; so much so was this the case that when entering an entirely new camp they were able at once to proceed to their respective stations as though they had long been familiar with them. The camp was usually arranged in the form of a square surrounded by a ditch. The earth from the latter was thrown inwards, thus forming a rampart ; on the top of this a palisade was erected by means of the wooden stakes carried by the soldiers. Naturally, a



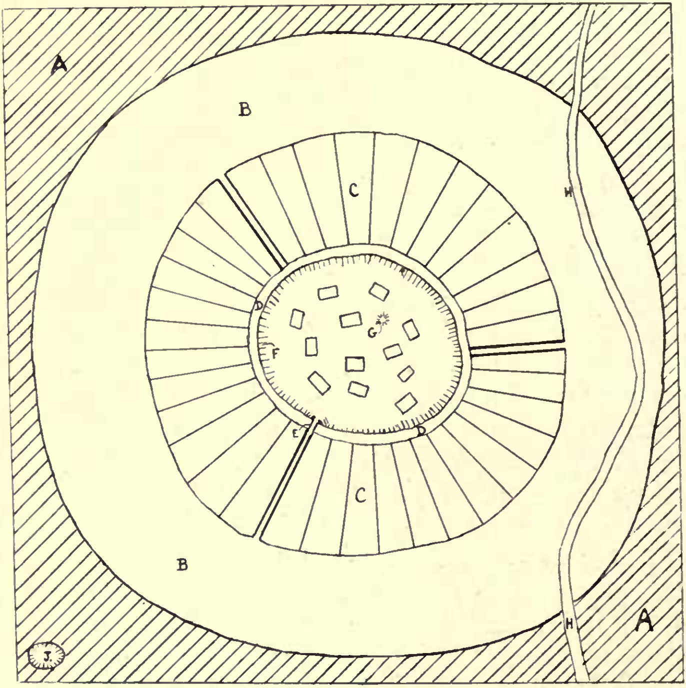
PLAN OF A ROMAN CAMP.

A. The gates.
B. The principal street.
C. A street between the tents, often used as a market place.
1. The general's tent, or *praetorium.*
2. The quarters of the chief magistrate.
3. Forum, or public market-place.
4. Quarters of the general's chief officers.
5. Quarters of special foot and horse soldiers.
6. The tents of the captains (*tribuni*).
7. Tents of the leaders of the allies.
8. Quarters of foot and horse soldiers.

camp that was to be used a few days only was lighter in construction than one destined for lengthy occupation. Each of the four gates was safely guarded, and sentinels were posted along the ramparts. (See " Camps," *Chambers's Encyclopaedia*, Vol. II, pp. 679–81.)

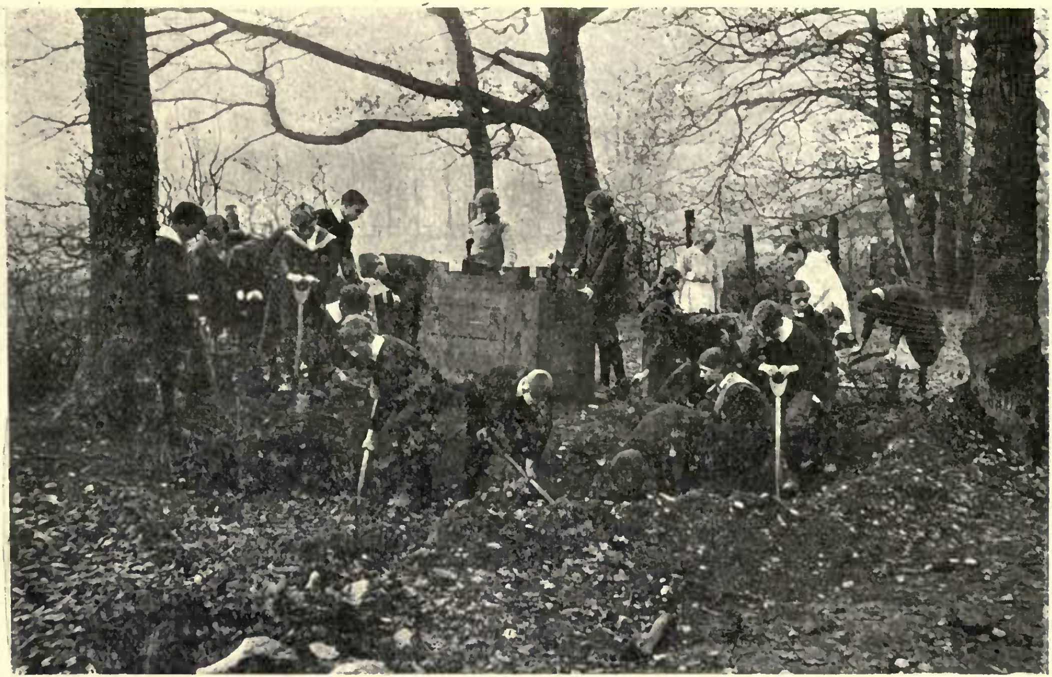
A fascinating study is that of the typical Anglo-Saxon village. A band of invaders took possession of as large a piece of the land as they felt they could hold, and then proceeded to make their homes there. The model of the village itself may conveniently be 6 to 8 ft. across, and this should be enclosed by a rampart surmounted by a stockade, and a moat. At one point the moat should be crossed by a drawbridge. In the centre of the village there should be a mound, upon the top of which a seedling tree should be planted to mark the place of assembly of the folk-moot. The houses may be made of twigs nailed to a wooden framework, and the roofs may be thatched with reeds bound with raffia. The village was surrounded by cultivated land divided into three equal parts, of which each part in turn was allowed to lie fallow for a year. Each of the other two fields was divided into as many strips as there were men in the village. In one field usually wheat or rye was grown, and in the other oats or barley. Each year there was a redistribution of strips, for frequently the land varied in quality, and by this arrangement each villager had the best strip in turn. This method of cultivation should be imitated in the model, wheat being sown in the autumn and oats in the spring. The only manuring attempted was that of bringing in fresh soil from the forest to spread over the fields, and in many cases chalk excavated from a chalk-pit was used for that purpose. Surrounding the cultivated fields there was a ring of pasture land in which all the villagers had equal grazing rights, and similarly the forest beyond was open to all for hunting, for wood-cutting, and for gathering wild fruits.

There were boundary lines in the forest to differentiate the land belonging to one village from that of its neighbours, and these lines were indicated by marking the trees. As a matter of fact the whole of the land belonging to a village was frequently known as a " mark." In the days when tribal wars were frequent, it was deemed unwise to admit strangers to the village enclosure, and for purposes of barter there were



PLAN OF MODEL SAXON VILLAGE.

A, forest ; B, meadow ; C, arable land ; D, moat ; E, drawbridge ; F, rampart and stockade ; G, moot hill ; H, stream ; J, chalk-pit.



Photograph by *A. G. Williamson.*

BUILDING A NORMAN CASTLE.

certain days—usually the occasions of religious festivals—when the inhabitants of adjoining villages met on the boundary line to conduct business. Thus the primitive market was held on the chosen mark. All this may be imitated—the mark may be put on the tree, the class divided into two sections, and each scholar may provide himself with the means of barter. There may be imitation corn, sheep, pigs, fowls, eggs, and so on, and the children may be asked to make suitable exchanges. It is surprising what poor ideas many children have of the value of things ; thus, I have known three cows to be exchanged for half a bushel of corn, and a fowl to be given for a sheep ; but such mistakes are not made by the same child twice.

One proceeds to the stories of the Danish invasions, and the children are led to see that a change must come over the life of the village. Some of the men are killed and their land is appropriated by others ; in the many conflicts one man stands out above the rest by reason of his strength and skill in battle, the others acknowledge him as their leader, his protection is sought by the weaker ones, many of whom pledge him their service in return. Thus, the strong man became the chief or squire and owned the greater part of the land, while the other villagers became simply tenants liable to expulsion, and paying a yearly rental in goods or service. In this way the feudal system was established in England before the Norman Conquest, and our scholars will understand the transition from the old communal ownership of the land to the present landlord system.

Another good historical model is that of a Norman castle. The site should be on raised ground enclosed by a moat ; the drawbridge, the walls, and the keep may be constructed of wood ; old packing cases provide suitable timber for this purpose. Turrets may be represented by drain-pipes fixed in the ground so that they stand upright with the flange uppermost. Additional realism may be gained by cementing the bottom of the moat so that it will hold water. For this purpose mix three parts stones, two parts sharp sand with one part Portland cement, and a small quantity of water. Line the moat with this mixture 3 in. in thickness, then cover with a thin layer of cement and sand only—one part cement to three parts sand, with sufficient water to form a paste. Protect the work from the heat of the sun, and if the weather is very dry sprinkle with water occasionally so that the cement sets slowly, then the moat should be quite water-tight. The construction of the Norman castle introduces the simple study of architecture, and wooden models may be made to illustrate the main features of the well-known types. Similar models may be made in clay, but of this more will be said in the section on modelling.

In recent years a great deal of attention has been paid to the dramatization of history in schools. Books have been written on the subject and many teachers have achieved much success in treating history in this way. We have found it a good plan to specialise in those scenes intimately connected with the neighbourhood of the school, and in the course of the year to prepare sufficient to provide a local historical pageant. The following are suggestions applicable to Woolwich ; they show the sort of thing that can be dramatized in a simple way : (1) British slaves under Roman masters making the road over Shooter's Hill ; (2) Wat Tyler's rebellion ; (3) The institution of the Order of the Garter ; (4) The Canterbury Pilgrims ; (5) Henry VIII " a-Maying " at Shooter's Hill.

It will be seen at once that real trees and grass provide the best setting for such scenes, and that there are many advantages accruing to their performance in the open air.

The children first make their own suggestions for the words to be used, and perform the piece accordingly. Some of the suggestions are good, and the teacher includes them in his own

Photograph by A. J. Green.

DRAMATIZED HISTORY—DEATH OF WAT TYLER.

presentation of the scene. Most public libraries contain books on local history, and from these much help may be obtained, even records of the actual words of past celebrities may sometimes be found. The costumes and other equipments may all be made in the school, and although crude the scholars put forth real whole-hearted effort in their preparation.

Turning now to the strictly geographical side of the subject, we commence by making a large-sized map of the neighbourhood of the school. Considerable accuracy is required from the older scholars. First, a horizontal scale and a vertical scale are decided upon, and a piece of land of sufficient size is cleared and levelled. The positions of river, hills, railway, and main roads are first indicated. Wooden pegs are driven into the ground in places, the part projecting above the soil being proportionate to the height of the place above sea-level. The map is brought into relief by depositing just sufficient soil to cover each of these pegs. The soil varies over the area, being in parts clay, gravel, chalk, and sand ; these are faithfully represented, and from these and the positions of the water-courses the geological history of the neighbourhood is worked out. This is connected up again with the history of the people.

Other maps are constructed in like manner to show the county, the whole of England, and various other countries. We have found it easier to cut away the soil from the part representing the sea rather than to build up the land above the sea-level. Some of the soil thus taken away is used in the representation of mountains.

Rivers may be marked with silver paper or lead foil, or simply by cutting out their channels. Lakes are well represented with blue paper covered with glass—the edges of the glass hidden in the soil.

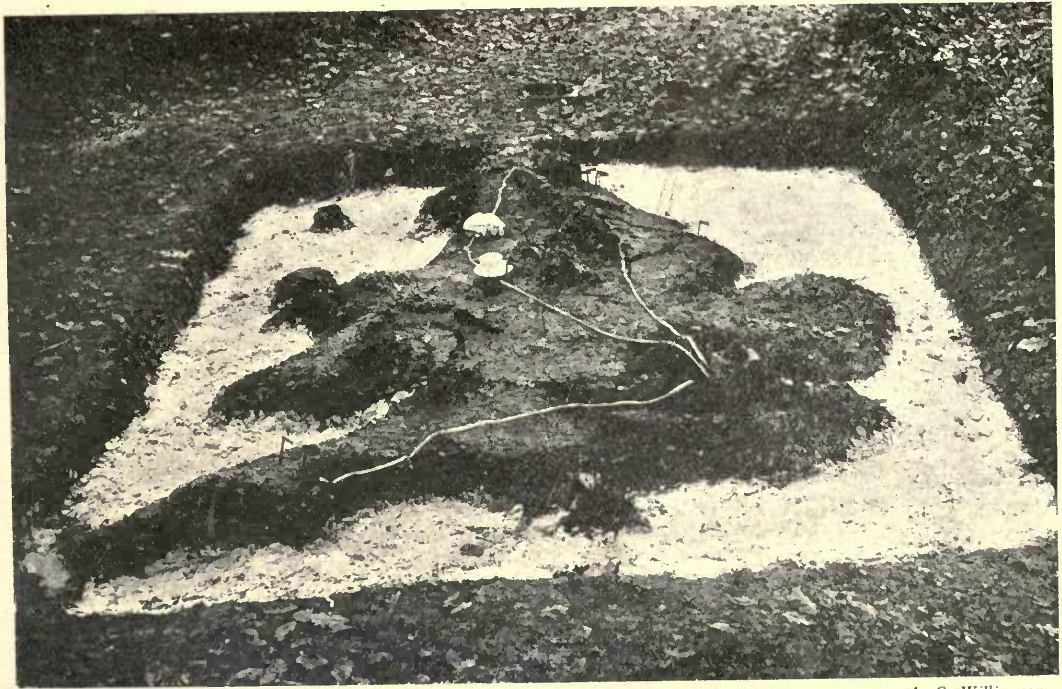
Big marbles serve to mark the towns, or, better still, labels may be fixed in the ground. In the photograph the labels are of wood with the names worked in copper foil. (*See* Chapter V, "Metal Work.")

Railways may be marked with white tape, or miniature rails may be laid, and toy trains run to illustrate the commerce of various districts.

One remarkable advantage in such maps consists in the facilities for indicating productions—a little coal spread on the ground marks a coal-field, pottery districts are indicated by a piece of earthenware, pasture land by a piece of turf, wheat may be sown on the corn lands, a model ship placed in a shipbuilding town, and so on.

Those schools which are situated near the sea or river ports can profitably take up the study of shipping. With a little practice it is possible to recognise the Line to which a steamship belongs by the colour of the hull and the marks on the funnel ; recognition is still easier if the house-flag can be seen. The routes of the various steamship lines are usually well advertised, and the purpose of many geography lessons may be to enable the scholars to answer the following questions with regard to any steamer in sight—Where is the ship going ? Where has it come from ? What is its probable cargo ? Similar exercises may be based on the study of railways if the school is in the neighbourhood of a large railway centre. Many of our Midland towns are served by several railway companies, and scholars should be expected to answer questions on the goods traffic similar to those suggested above with regard to shipping.

Another very good geographical exercise especially suitable for Open Air Schools has for its object the explanation of contour lines. The children are asked to walk along the face of a hill keeping to one level—that is, they are actually to walk along a contour line. After a little practice they are able to do this. Then a number of them are started off together at different heights. It will soon be apparent that where the



Photograph by *A. G. Williamson*

MAP OF ENGLAND.

hill is steep the contour lines approach each other, while on the more gradual slopes the lines diverge.

Mr. A. J. Green, Head Master of the Birley House Open Air School, Forest Hill, S.E., has kindly supplied the following account of the geographical work of his school—

"In view of the fact that the scholars are drawn from the very poorest—often slum—areas of South London, we are endeavouring to inculcate into their minds an idea of 'Colonisation,' and this idea is the basis on which all our schemes of work hinge.

"We are sanguine enough to hope that with renewed health and vigour they may eventually become tired of their 'slum' life, and wish, in time to come, to get away into a freer, healthier air.

"Our Gardening, Drawing, and Manual schemes are so arranged as to include a miniature scheme of Colonisation.

"A waste portion of the garden, overgrown with small shrubs and rank growths, has been cleared. Trees have been cut down and their roots grubbed out. On this reclaimed ground seed-beds have been made. A small farm of six fields, each one rod square, has been plotted out, and a rotation of crops sown, consisting of Roots (turnips and potatoes), Barley, Cabbages, Oats, Wheat.

"Each field will be fenced differently—the six types being Chestnut, Barbed wire, Twisted wire, Bar, Rustic, and Canadian.

"A log hut, 6 ft. by 4 ft., has been constructed and furnished, and a model dairy is to be attached to the end.

"The space around the log hut, or farmyard, is to be occupied by a three-stall stable, a pigsty, a waggon-shed, a barn, a hen-roost, a dog-kennel, and a pump; all models made to scale by the lads in their simple woodwork lessons. Thus the homestead, farm premises, and farm are complete, and the food supplies of the colonist assured.

" This work is followed by another side of colonial life often forgotten by the would-be colonist, and so in the Geography lessons we work towards the establishment of an industrial colony.

" In this scheme heaps of metallic ores—iron, copper, lead—coal, stone, and gold quartz are secreted under the bushes in various parts of the garden. The class as Colonists are to go out Prospecting. Minerals are to be found, and so each child is given a flag, and diligent search is to be made to find such minerals of value to the Colonist.

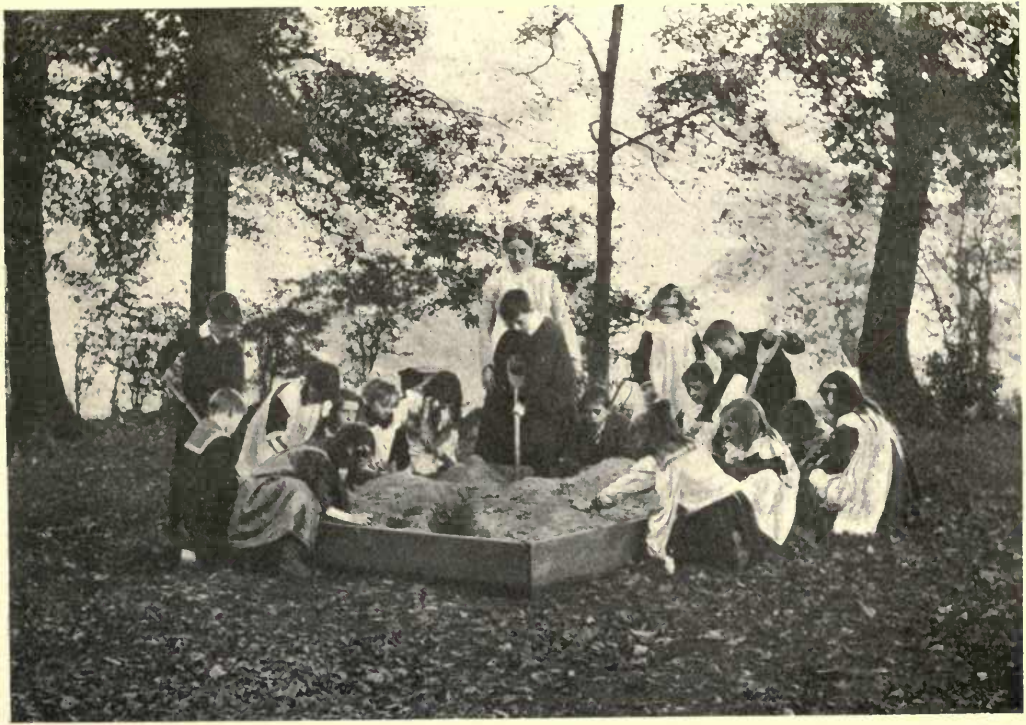
" Should such a search be successful, the finder must stake his claim to that mineral by planting his flag. The lucky prospectors register their claims with the teacher, and if accepted are made *Captains of Industry* as a reward for their observation.

" The lad who finds the iron ore is the Ironmaster ; the coal, Coal-mine owner, etc. These Captains of Industry, with the co-operation of the teacher, then secrete their various finds under heaps of clay in order that the whole industrial scheme may be centralised. The mineral is spread over a surface about 3 ft. by 4 ft., and a heap of clay 2 ft. high is made to cover the whole. This operation is necessary for future boring to find the minerals.

" The next step is for the employment of miners. Each of the Captains of Industry gets into communication with the Secretary of a Labour Exchange which has previously been opened up in the class, and requests that he shall advertise through his agency for Coalminers, Ironminers, Leadminers, Copperminers, Golddiggers, and Quarrymen.

" These advertisements are issued and replies are received from the class seeking employment in whichever trade they desire. The replies are referred to the Captains, who choose their workmen.

" These workmen, with their leaders, then repair to that



Photograph by *A. J. Green.*

MODELLING IN SAND.

section of the Centre where their mineral is supposed to exist, and with a simple boring apparatus, constructed in the school, they bore into the mound of clay.

" The mineral is eventually discovered and the shaft sunk and lined with golden syrup tins, from which the tops and bottoms have been cut away.

" A simple winding apparatus is next required and made, and the various minerals are brought to the surface : coal from the colliery, and iron ore, copper ore, and lead ore from the respective mines.

" The next step in the evolution is to lead the miners to realise for themselves that their work, after obtaining the raw material from their mine, is at a standstill. The raw material must be worked, but at present they have nothing to work it with. They quickly realise that coal is an absolute necessity to them.

" With this knowledge, the various Captains of Industry make overtures to the Colliery owner for an interchange of commodities, and to carry forward this interchange a line of railway is necessary. Platelayers, Coachbuilders, Engine-drivers, etc., are needed to make this line of communication.

" The Labour Exchange is again sought and workmen employed.

" When this interchange is brought about, the need of furnaces and factories arises. Builders, etc., are needed, and stone is brought from the stone quarry.

" In this way the whole of the children are given an interest in the scheme by becoming working units in the industrial centre.

" An amusing sequel to this came to my notice a few weeks ago. I noticed certain of the lads were wearing cardboard badges in the lapels of their coats. On inquiry I found they were trade union buttons, denoting the union they had joined. This was quite on their own initiative ; I mention it to show the keenness with which they take to the work.

"To continue.—With the erection of the factories, etc., the concrete portion of the work ceases. The manufactured articles produced in imagination at these factories must be tabulated and, where possible, miniature replicas obtained. These are then conveyed by rail to a River Birley, which is being constructed by the smaller children, and on which Port London, with the necessary dock, bridges, etc., will find a place, and from which a fleet of steamers will take our manufactured articles for distribution.

"Thus our scheme seems complete, in that it starts with the breaking up of the soil, and ends with the distribution of manufactured goods."

CHAPTER IV.

Nature Study and Gardening.

THESE are subjects taught in most schools at the present time, but of all the subjects of the ordinary curriculum these are the most suitable for Open Air Schools. Under indoor conditions little either of real gardening or real nature study is possible, and especially is it necessary to protest against the attempts, that many people still make, to treat nature study entirely or almost entirely as an indoor subject.

Before sitting down to write his syllabus, the teacher should take a walk round the school site, and make a list of the living things which are to be seen, in both plant life and animal life ; to this should be added some notes on the soil. This list will probably cause surprise on account of its length, but its perusal will reveal the absence of some subjects that one would be glad to include.

Many plants may be imported, brought in as the trophies of an afternoon's ramble, planted and grown in an environment made to resemble as nearly as possible that in which they originally grew. If necessary it should be possible to make a miniature meadow with its typical grasses, buttercups, and sorrels ; it should not receive the attention of scythe, shears, or mower until the plants have blossomed and fruited ; then there may be the hay-making and the diminutive hay-stack as a contribution to the comfort of the school pets. Similarly the scholars may make their own hedgerow—hawthorn and wild roses, with the rambling blackberry and climbing clematis. A miniature heath with its gorse, broom, heather and cranesbills may be easily made on a heap of porous soil ; a diminutive bog and a pond as a home for aquatics are further suggestions which our own experience has shown to be well within the power of the Open Air School class. At the present time we are constructing what we term a "wild" wood garden. It is to be in a tiny dell under the shade of a small group of trees ; having prepared the soil, we are planting bluebells and daffodils, lilies of the valley, Solomon's seal, and foxgloves, bracken and male fern. It is only necessary to provide the environment and the creatures provide themselves. Ants, grasshoppers, and crane-flies make their home in the miniature meadow, birds and spiders in the hedge, frogs, gnats and may-flies in the pond, and so on. The reader will at once see that for the city child it is both possible and profitable to make nature study and gardening just the theory and the practice of the same subject, and yet I do not suggest that it should be entirely so in the Open Air School ; the scope of gardening may be much larger than this.

The following syllabus—to which, of course, "Weather Study" (Chap. I) should be added—is intended to be merely suggestive ; it is suitable for children of all ages, and indicates what experience has proved to be the best time for the various studies.

SPRING.

The sleeping and awakening of seeds.

The hedgerow in spring—hazel, willow, birds' nests and eggs, celandine.

The pond in spring—frogs, toads, newts.

SUMMER.

The pond—insects, fishes, plants.

Common flowers and the insects which visit them—bee, butterfly, moth, ant, fly.

Grasses.

AUTUMN.

The heath—its plants and animals.

The study of fruits and their dispersal.

Birds as seed distributors. Migration of birds.

Photograph by *A. G. Williamson.*

GARDENING.

The trees in autumn—falling leaves, fungi, earthworms, snails, spiders.

Methods of reproduction other than by seed—bulbs, corms, creeping stems.

WINTER.

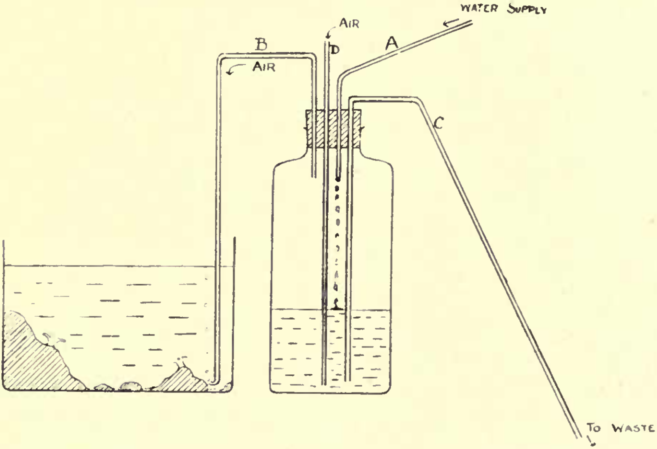
The long sleep—trees, frogs, snails, squirrels.

Evergreen trees.

Winds and clouds.

The study of soils. Lessons on various rocks, *e.g.*, clay, sand, gravel, flint, chalk, and granite ; the types of scenery produced by these rocks.

For purposes of Nature Study certain creatures may be kept in the school as pets. In the choice of these creatures one has to consider—firstly, whether they are likely to be happy in confinement ; secondly, whether one can provide suitable food and shelter for them ; and, thirdly, whether they are going to serve a useful purpose. It is better to have a variety of creatures to use as types of the animal kingdom rather than to have a large number of specimens of similar type. Thus, although pigeons, doves, and rabbits are easily provided for, one should be careful to keep their numbers down in order to be able to accommodate other animals which will be equally useful. Amongst birds the jackdaw makes a splendid pet, and contrasts well with the pigeon and dove, although his habit of attending the needlework lesson to steal thimbles is a little disconcerting. The guinea-pig is suitable for contrast with the rabbit ; the hedgehog is useful for lesson purposes, but I am afraid he is not very happy in confinement. The tortoise is good, and the squirrel is very popular and very tame if bred in captivity. Every school to-day has its aquaria for the accommodation of small water creatures, and it is unnecessary for me to do more than to plead that the tanks should be large, with plenty of water, plenty of weed, plenty of snails, plenty of sunshine, no dust, and no interference. Exception must be made in the case of marine aquaria, since it is hardly possible to get seaweeds to grow in them. Artificial aeration is necessary, and for this purpose we have found the apparatus illustrated to be simple and most efficient. A large bottle is fitted with a cork, through which four holes have been bored for the passage of four tubes. The first tube A is connected to the water tap, and by this means the bottle is filled with water; the displaced air can only get out of the bottle through the tube B, which conducts it to the marine aquarium. When the bottle is full, the tube C automatically serves as a siphon, and by its means the bottle is emptied of water and filled with air again through the tube D. As soon as the level of the water in the bottle is below the end of the tube C, the siphon stops working and the bottle is gradually filled with water again from A—so the alternate filling and emptying goes on as long as the tap is turned on, and every time the bottle is filled with water an equal volume of air is

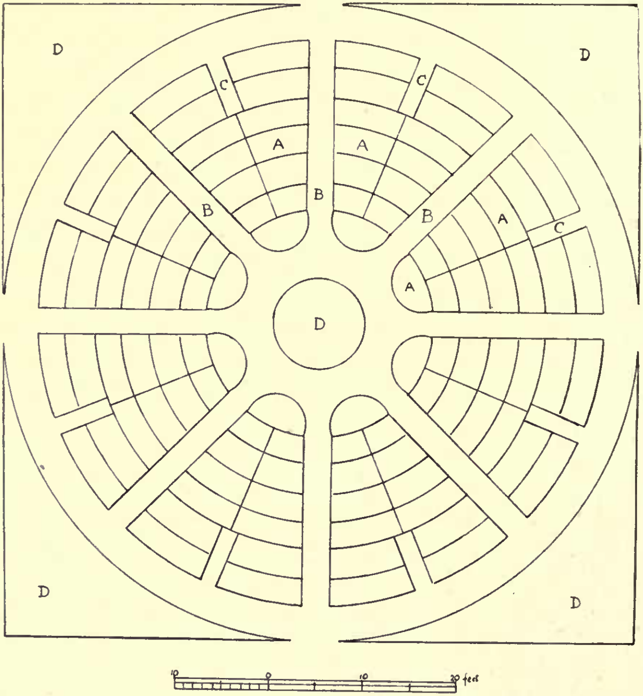


AERATING APPARATUS FOR MARINE AQUARIUM.

pumped into the aquarium. It will be seen that the following precautions are necessary: (1) only tubes C and D reach to the bottom of the bottle; (2) tube B must reach higher than tube C; and (3) tube C must be of larger bore than tube A.

For the accommodation of insect life it is a good plan to construct a cage of larger dimensions than usual. A cage of suitable size is about 6 ft. long, 2 ft. wide, and 4 ft. high. The framework may be of wood, one or two sides glass, the other sides and the top of perforated zinc. Food plants for caterpillars should be grown in the soil at the bottom, and unless all the plants are of one variety the separate kinds should be covered with bell jars until the caterpillars are well grown. Pupation takes place in the soil, on the plants, or in the corners of the cage, and when the perfect insects emerge most of them may still be kept in captivity. At this stage flowers should be provided, kept fresh in test tubes of water embedded in the soil. These blossoms may be of any variety so long as they are brightly coloured. They should be sprayed with water, then sprinkled with castor sugar. It is interesting to watch the insects taking this food, for the proboscis can be seen quite clearly, and enables the children to assign a reason for the shape of honeysuckle, campion, and other flowers which are almost exclusively visited by moths. The size of the cage gives room for the creatures to use their wings, and since their natural food plants are present, one may expect eggs to be laid and the life cycle to begin again. We have been able to keep insects through two generations before a mishap to the food plants spoilt the sequence.

We have previously referred to that gardening which had for its object the imitation of wild nature; let us turn now to the cultivation of plants in a more formal manner. For the most part gardening is a new subject in the curriculum; it has made rapid progress, but various conflicting views are held as to its real purpose. It is usual in country districts to regard it merely as the imparting of up-to-date methods of cultivating crops in order to get the largest returns, and frequently splendid results are shown. I have every sympathy with this view, but I hold of equal importance the need of using the subject for the development of initiative and forethought.



PLAN OF PART OF GARDEN, SHOWING (A) INDIVIDUAL PLOTS AND (D) SOME DEMONSTRATION PLOTS.

No other school subject provides such facilities for this training, and if we make this a real aim then, probably, the extent of the knowledge of plant cultivation will suffer, but in the end the boys and girls will make better gardeners, or better workers, in any other vocation where intelligence is required. Other considerations must be made clear before the outline of the gardening scheme is given : first, the time given up to gardening cannot average more than an hour a week per scholar if the other subjects are fairly treated ; second, the area of the garden will probably be small ; and, third, if possible, all the scholars in the school should have a share in the garden.

Experience has proved that it is a good plan to let each scholar have a small plot for his or her very own, so that very largely they can grow what they like and how they like, and have the produce themselves ; but for purposes of instruction there should be other plots (called general plots to distinguish them from the individual plots) worked on the communal system, but in which the teacher has his own way. The individual plots will illustrate many wrong methods of cultivation, the general plots will show the right methods. In the accompanying plan the eight wedge-shaped beds (A) are divided into 104 individual plots, and this form makes it possible to adjust the size of the plot to the capability of the child. The smallest scholars have pieces rather more than a square yard in area, the senior boys and girls have plots three times as large. The main paths (B) radiating from the centre are 3 ft. wide, while the small paths (C), which give facilities for easy access to all parts of the larger plots, are only 2 ft. wide. The beds marked D are intended for demonstration purposes ; they should contain for the most part such flowering plants as the children cultivate in their own gardens, and should be suggestive of picturesque arrangement and correct culture. They may also contain decorative plants which would be too large for the individual plots, and one of them might serve as the site of a rockery and tiny water garden. The effect of rockery and water garden combined may be very charming as far as appearance is concerned, and, moreover, most valuable for ecological purposes, as in the small area one may accommodate all types of vegetation, from the purely aquatic to the extremely xerophilous.

The straight paths may have wooden borders, and in the long run it pays to have them of a substantial character. Creosoted deal 5 in. wide by 1¼ in. thick, is excellent, and will last for many years ; it should be fastened to pegs driven into the ground, the pegs being 2½ in. square, 2 ft. long, pointed at one end, and similarly creosoted. The curved borders should be of tiles set in cement, or they may be made of concrete covered with cement. For the concrete use three parts small stones, one part sharp sand, one part Portland cement. The border should be marked out by driving two rows of pieces of batten into the ground, leaving a space 2½ in. wide between the rows to be filled in with concrete. It is a good plan to imbed a length of stout iron wire in the concrete to add to its strength. When the mixture has set, pull out the pieces of batten, and cover the concrete with a layer of cement half an inch thick, finish off as smooth as possible with a small trowel. In some schools men have been employed to lay out the garden—prepare the soil, fix the borders, make the paths, and do what fencing is required. I cannot help thinking that it is a mistake to deprive the scholars of the chance of doing it themselves. Under good guidance they can do all this work efficiently, and with evident pleasure ; the healthy exercise, the knowledge and experience gained are of inestimable value.

Each child should be entirely responsible for the preparation of the soil in his own plot, trenching it and adding to it manure, sand, lime, leaf-mould, as may be necessary. When a good tilth has been obtained, the teacher gives a lesson descriptive of the seeds which are available, and demonstrates the various methods of sowing. The scholars then choose the seeds they wish to grow, sow them, and care for them to the best of their ability.

Photograph by *A. G. Williamson.*

SKETCHING A POND.

The programme of a gardening lesson will usually include —first, a general talk on current work ; second, the children take what tools they require and proceed to their plots to do what is necessary ; third, each child writes up his diary ; and fourth, he reports himself to the teacher as available for work on the general plots.

On wet days the lesson is given under cover, the special culture of various crops may be dealt with, or sometimes a particular gardening operation such as potting may be demonstrated, or there may be a talk about tools or pests. Time should be left towards the end of the lesson for the making of notes or sketches. To facilitate the keeping of a diary some pages of the note-book should be ruled up somewhat as follows—

Name of Plant.	Date of			Distance Apart.	Products.
	Sowing seed.	Sprouting.	Transplanting.		

Under the heading " Products " should appear particulars of the time of flowering, the form and the colour of the flowers, or the time when the vegetables were mature, the quantity and the value.

The plan shown of part of the garden does not include the general vegetable plots, which should have a combined area of at least 10 rods ; that is to say, they should be equal in area to a rectangular plot 60 ft. long and 50 ft. wide. This kitchen garden should be worked as a model allotment, so that among other things the scholars will learn how to spend their leisure time profitably in the open air when, later on in life, factory and office claim the greater part of their time. Further, such work will indicate to the most suitable boys and girls how to earn their living entirely on the land. We must remember that the life in the Open Air School makes restoration to health possible for these children, and it is equally true for many of them that an open air life is the only means of keeping that health.

When school days are over it should be possible to place many boys and girls on farms, small holdings, or market gardens, but in order that the plan may continue to be successful, the selection of suitable children must be very carefully made. The experience in the gardening lessons should assist very considerably in making these selections, and the garden work should be of such a nature as to give the children an idea of the kind of problems they will have to face when "back to the land."

All the common vegetables may be grown, and it is a good plan to divide the allotment into three plots, to be used in rotation, for potatoes, for legumes, and for the cabbage tribe and root crops. Fruit, including apples, pears, plums, gooseberries, currants, raspberries, tomatoes and strawberries may be grown round the edges of the plots, as in this position they get more light and air than when grown in special beds.

Among fruit trees the single cordons are likely to give the most satisfaction, as they occupy little space and quickly reach the fruit-bearing stage. For contrasting methods of cultivation have a few tomato plants near the fruit trees. In both cases the aim is to get the largest possible crops, but the methods vary considerably since with the tomato only one year's crop has to be considered, while with the fruit tree one seeks a succession of crops.

The garden will not be complete without a cold frame, even if one has to forego the pleasure of the possession of a heated greenhouse. The cold frame is always of use—for seedlings in spring, for cucumbers in summer, for cuttings in autumn and winter. Compared with its utility, the cost of the frame is trifling if it is constructed by the scholars.

Photograph by *A. G. Williamson.*

EXAMINING THE BROOD-COMBS OF A BEE-HIVE.

For obvious reasons the gardening instruction should not deal solely with the cultivation of flowers and vegetables. There are profitable side-lines to be undertaken, including the keeping of poultry, rabbits and bees. Some Open Air Schools are going further, and have both cows and pigs. The care of a cow is a serious undertaking, but of great value to the school if it can be done properly. The inexperienced teacher will be well advised to try a goat first, and to begin dairy work on a very limited scale. Certainly the garden will benefit if these creatures are kept, firstly, because they will use up much produce not suitable for human consumption, and, secondly, for the manure they provide.

Bee-keeping is rapidly becoming popular as a school occupation. The hum of the hive has an inexhaustible charm on a summer's day, and a colony of bees in a corner of the garden will provide illustrations for many Nature lessons. Moreover, there is a spice of adventure in bee-keeping which appeals to many children, and I must admit that several of my pupils are much braver than I am when working at a hive, and this in spite of the fact that they know what it is to be stung. Begin by purchasing a W.B.C. hive in the early spring, and book a swarm from a large apiary. Have the frames, comb-foundation, and quilts for the hive absolutely new, and all ready by May 1st in case you are fortunate enough to get an early swarm. Be very slow to purchase second-hand hives, hive-fittings, and appliances, as at the present time many are anxious to sell such equipment since they have lost their bees through disease. Such material may be obtained very cheaply, but it ought to be destroyed, as it may be the means of spreading disease. Full instructions for bee-keeping may be obtained from the *British Bee-keeper's Guide Book.*

It is difficult to know when to stop writing about gardening and its allied subjects, but it is outside the scope of the present volume to do more than give teaching hints. Let it suffice to conclude with a brief summary of a gardening syllabus.

1. **Soils.** Heavy and light soils and their preparation for crops.

2. **Manures and Manuring.** Natural manures from stable, pigeon-loft, rabbitry, and fowl-run. Experiments to note effect on crops of various natural and artificial manures. The use and abuse of the rubbish heap.

3. **Seeds.** Preparation of seed-bed and methods of sowing. Percentage of germination.

4. **Transplanting.** When and how to transplant seedlings.

5. **Fertilisation of flowers and setting of seed.** How to prolong the flowering stage of a plant.

6. **Methods of culture** to secure fruit, leaf, stem, or root crops.

7. **Gardening operations.** Watering, digging, double and bastard trenching, hoeing, budding and grafting, pruning, cuttings, construction and use of hot-bed.

8. **An allotment.** Its arrangement and care.

9. **Observations on animal life in the garden.** Destruction of pests.

10. **Garden tools.** Spade, fork, trowel, hoe, shears, mower, sieve, etc.

11. **Exercises in profit and loss, percentages, etc., based on garden produce.** Annual balance sheet. Besides the general balance sheet and balance sheets of individual plots, each crop is dealt with separately to discriminate between successes and failures.

CHAPTER V.

From Paper Cutting to Metal Work.

In handwork of the type usually associated with indoor schools there are three guiding principles. First, the grading of the work in order to present exercises of gradually increasing difficulty. Second, to make each exercise interesting in itself, by introducing variety and also an element of utility. Third, the aim should be to cultivate accuracy, ingenuity, and facility in the handling of tools.

It is but a year or two since the conferences and discussions and debates and papers on the value of handwork and the question of its general introduction for all classes in schools. Ardent supporters of handwork quoted Rousseau until one was almost tired of hearing of him. One quotation, however, impressed me very much—it was from Carlyle: "The choicest present you can make a boy is a tool, be it knife or gun, for construction or destruction; either way, it is for work, for change." There is a great deal of scope for reading between the lines, both with regard to the boy (and it is equally true for the girl) and also the teacher of the boy. It gives the picture of the scholar wholly occupied in a pleasurable task, making real progress largely on his own initiative—the teacher watching, helping, hinting, planning, with equal pleasure.

Carlyle was not quite right in putting construction and destruction on the same footing, for the joys of construction are usually much more lasting than those of destruction; but, while admitting that there is a very real pleasure in the use of the gun, surely our modern civilisation should tend towards the development of the pleasure to be obtained from the use of constructive tools, thus eclipsing the spirit of the destroyer. Handwork, like an Aesop's Fable, has a moral.

Paper Cutting.

Of media for manual work undoubtedly paper is one of the most simple, and of the different kinds of paper probably cartridge paper is the most useful. The method of manipulation varies—there is free cutting, folding and tearing, folding and cutting, ruler drawing and cutting, and all these methods may lead to picture-making by pasting and mounting, colouring, and so on. There is an almost endless variety in paper work, so much so that it is difficult to make up a graded series of exercises, at the same time securing that the different types shall be interwoven.

One may begin with free cutting in order to give practice in the use of scissors. The children are supplied with plain paper and crayons, and, dispensing with outlines, figures are cut out of the paper and then coloured—a leaf, an orange, a flower, a lamp-post, a pillar-box, a house may all be represented in this way. They may be mounted on a sheet of stiff paper or cardboard to preserve them. The method gives exceptional opportunities for co-operative work. Suppose, for instance, one wishes to make a picture of the school. The children are asked to take a share in it ; one child cuts out a classroom, another the dining shed, another a tree, another the garden fence, and so on. When finished and coloured, each contribution is pasted on to a sheet of cardboard, and the final touches are put on—blue sky, green grass, etc. A street, a bridge, a market-place, are other good subjects for composite pictures by this method.

The next step is to give practice in accurate cutting along a line—this may be done by allowing children to draw an outline first, by supplying pictures or drawings to be cut out, or by folding the paper and then cutting along the creases. The usual plan in paper folding is to start with a square of paper, and to fold it in various ways to obtain rectangles, triangles, etc. Symmetrical curves, such as are required to represent a vase or a bell, are made by folding the paper in halves and cutting through the double thickness. By this method realistic pictures may be made of a fence, a ship, a candlestick, a gate, a pillar-box, or a castle. More effective pictures may be made by using squares of brightly coloured papers; then white or black crayons are used to indicate high lights and shadows; the work will probably be cleaner if the paper is supplied ready gummed. The next step will be to introduce the ruler, and, before cutting, to draw lines to a given length—thus a square and an oblong may be made on squared paper exactly to size. The square may be folded, cut along the diagonals, and used to make a paper windmill when a pin and strip of wood can be supplied. This will add interest. The square is made for a purpose, and, moreover, any inaccuracies in measuring or cutting are made to look very glaring when the diagonal folding is proceeded with. Further exercises in accurate measuring and cutting out are furnished in the construction of a ruler, a picture frame, and an envelope.

Strip Cardboard Work.

For this type of handwork, strips of thin cardboard are supplied 18 in. long and ½ in. wide. They are cut with scissors, and midget paper fasteners are supplied to join pieces together. The aim is accuracy.

The first exercise may be to cut off a strip 6 in. long, and to make holes with the point of the scissors at half-inch intervals. Such a strip is used for making circles—a drawing-pin through one of the holes fixes the centre, and a pencil-point through another will serve to mark the circumference. Other exercises are the following: Letter L, letter H, a foot rule, a railway signal, a picture frame, a fence, a gate, a pair of scales, lattice work.

Sheet Cardboard Work.

In the early stages one continues to cut with scissors; later on, cutting with a knife and safety straight edge is introduced.

The finest cheap adhesive I know of is Steko, used by bookbinders, and supplied as a powder ; it has only to be poured into boiling water to make a paste of the desired consistency. A small quantity on a palette or piece of paper is supplied to each child, and the simplest method of application is by means of a finger tip. Other requirements include paper in a variety of colours, and linen binding strips half an inch wide. In this work and in all the more advanced types accurate drawings are made before the exercise is proceeded with.

The following models form a good series—

1. A square tray with upright sides.

2. A clock face.

3. A draughtboard with a set of draughtsmen. The draughtboard is made to fold into four parts ; squares of coloured paper are affixed to form the pattern.

4. A circular mat with hexagonal pattern shown in coloured paper.

5. A square tray with sloping sides. This may have paper panels on the sides and bottom.

6. A match-box holder to hang on the wall.

7. A cube. This may be used to illustrate a cubic decimetre or litre.

8. A specimen box. The individual boxes should be small, and, if possible, be fitted with glass lids. A large box should be made to accommodate all the small ones ; thus a museum case is constructed ready for a collection of rocks, fossils, shells, etc.

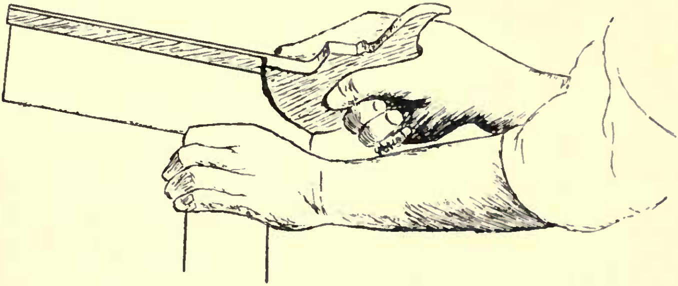
9. A pencil box.

10. A breeding-cage for caterpillars. The dimensions of this should be at least 10 in. × 7 in. × 5 in. The door should be of glass, and there should be muslin panels in the sides.

Strip Woodwork.

Two-foot lengths of ready-planed wood are supplied in a variety of widths and thicknesses, the most useful sizes being ½ in. square, ½ in. × ¼ in., and 3½ in. × ¼ in.; then ¼ in. square and ½ in. round are very handy at times. Satin walnut is the usual material, as it is remarkably free from knots, and looks well when made up.

The tools required include a marking knife, small saw, hammer, try square, bradawl, and bench hook for each scholar, a brace and set of bits for the class, and an assortment of small nails.



CORRECT METHOD OF HOLDING A SAW.

Having reached this stage the children should be able to measure accurately, so that the initial difficulties in strip woodwork consist in the use of marking knife, saw, and hammer. In using the marking-knife for making cut lines on the wood where it is to be sawn, the attention of the children should be drawn to the distinction between the use of cut lines and pencil lines. As a general guide, cut lines precede the use of the saw, but pencil lines are used in all other cases.

With regard to the saw, it is awkward at first to grip the handle with the thumb and three fingers, leaving the first finger free to steady the blade, yet that is the plan which must be adopted. The wood to be sawn must be held firmly against the stop of the bench hook. No mechanical aids for the guidance of the saw should be allowed.

In the case of the hammer the tendency is to hold it too near the head ; one can be sure of hitting the nail that way, but not hard enough or true enough to drive it in straight. The hammer must be held at the thickest part of the handle.

When using the bradawl, take care that the cutting edge is at right angles to the fibre of the wood in order to bore a hole.

The first exercise may serve to give plenty of practice in the use of the saw—a set of Tillick's bricks to be given to the little ones in the school, or a set of dominoes. In the case of dominoes, the numbers should be marked by driving in nails up to their heads, and the dividing line across the centre indicated by a slight saw cut. Further suggestions are as follows—

A marking board for use with the dominoes described above—this is to give practice in the use of the bradawl.

A letter H.

A railway signal.

A string winder.

A ladder—this may be used in the aquaria for dragon-fly pupae to climb out of the water.

A pen tray.

A toothbrush rack.

A letter rack.

A doll's table—in this case make a proper framework before fixing the top on ; it is useless to drive nails into the end grain of the legs.

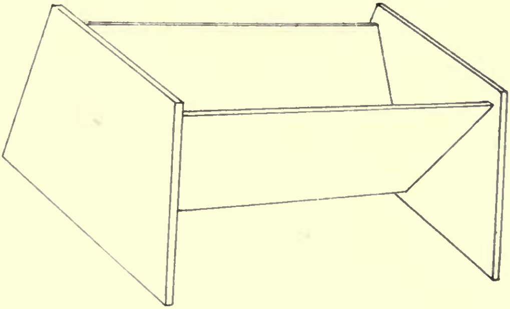
A seed protector—a pair of triangular ends by means of which black cotton can be stretched over the seeds.

A soap box.

A sponge rack–this requires the ½ in. round strips (dowels).

WOODWORK.

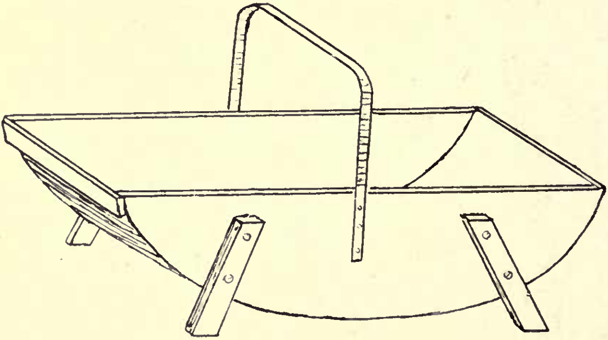
The woodwork with which I have been associated in the Open Air School has taken very largely the nature of carpentry rather than that of the cabinet work practised in the ordinary schools. It lacks the finer parts of woodwork and the very careful finish, but it gives more physical exercise, is more suited to outdoor conditions, is more economical as regards tools and equipment, and is, probably, more useful. The new tools to be used include the hand-saw, the bow-saw, the wood-cutter's saw, the jack-plane, and chisels (firmer chisels and mortice chisels in various sizes). It is not necessary to provide bench accommodation for every scholar, as a good deal of the work consists in the actual erection of small buildings ; three benches, accommodating six boys, will be found sufficient for a class of twelve. This arrangement will suit those schools where rigid economy is necessary—on the other hand, if it is possible to provide a workshop, similar in construction to the classrooms described, but fitted with twelve benches to accommodate a class of twenty-four, then it would be available for handwork of all kinds. Undoubtedly, in the near future, such a workshop will be regarded as a necessary adjunct to every school.



A FEEDING-TROUGH FOR RABBITS.

The following is a list of woodwork exercises, with brief notes on some of them—

1. A seed-box.
2. A bench hook.
3. A slat (*see* p. 41).
4. A feeding-trough for rabbits.
5. A sledge.
6. A garden basket.
7. A cold frame.

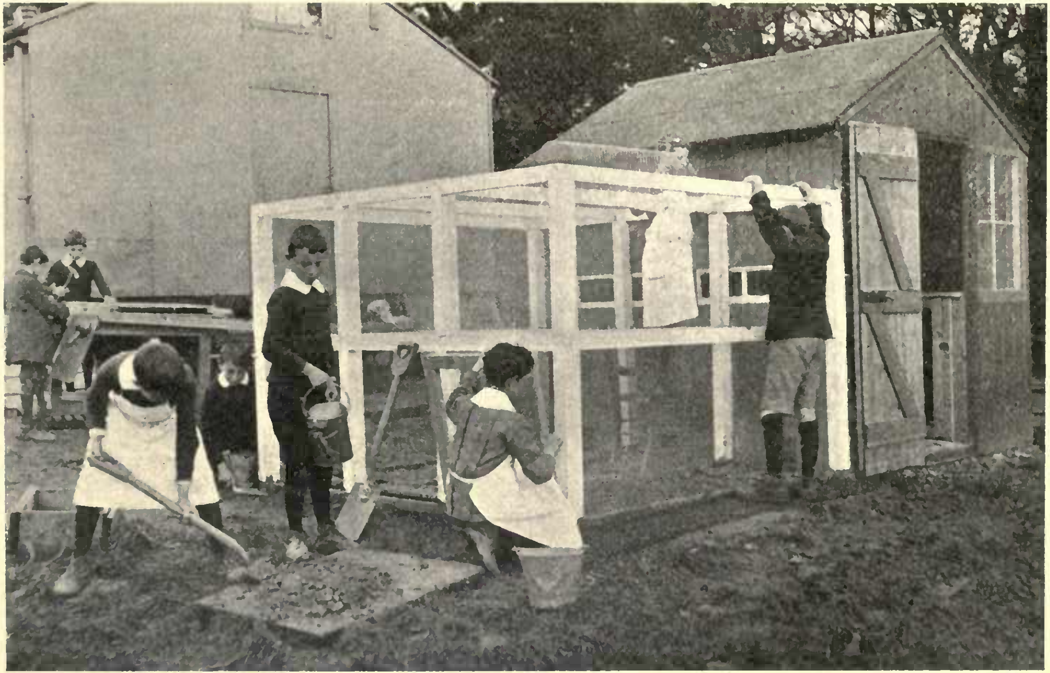


A GARDEN BASKET.

8. A bee-hive (see *British Bee-keepers' Note Book*).
9. A tool-shed.
10. A fowl-house.
11. A pet-house.
12. Rustic arches.

The *Sledge* is intended for garden use. It consists of a stout box with hardwood runners, and is drawn by means of rope. Sledges are much cheaper than wheelbarrows and almost as useful.

The *Garden Basket* is used chiefly for the carriage of garden produce. The sides are of wood, the bottom consists of an

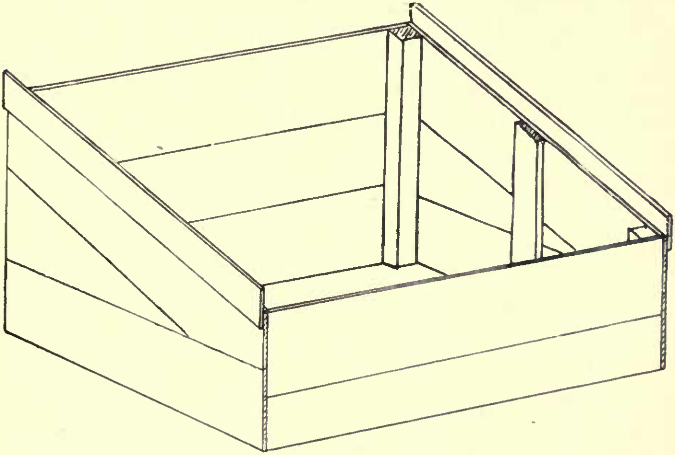


Photograph by *A. G. Williamson.*

BUILDING A PET-HOUSE.

odd piece of linoleum, the handle has a core of iron tape which is covered with cane and bound with string.

The construction of the *Garden Frame* will be understood from the drawings given. The frame light has to be carefully made. The top and bottom rails are united to the stiles by mortice and tenon joints. The bottom rail must be thinner than the other parts, so that the glass may cover it : then rain will run off easily.



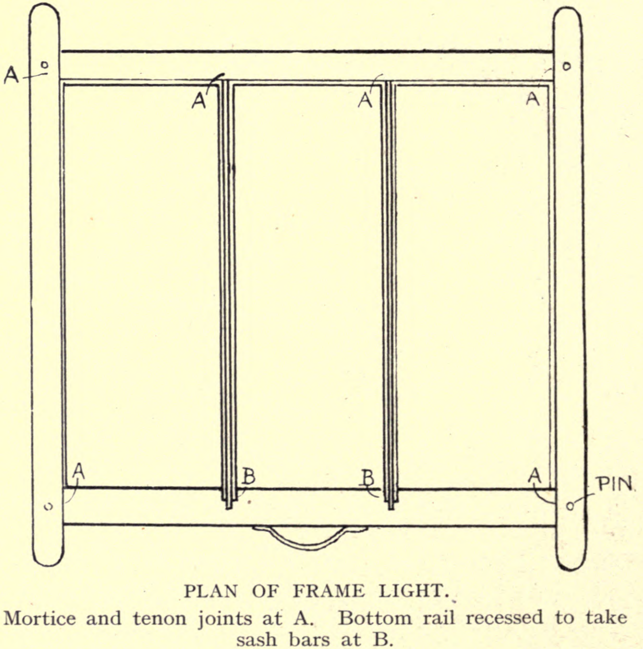
A GARDEN FRAME WITH THE FRAME LIGHT REMOVED.

The *Tool-shed* should stand in a corner of the garden ; it should have two doors, so that the scholars may march through, hanging up their tools as they pass.

A *Pet-house* which has just been erected at the Shooter's Hill Open Air School is modelled somewhat on the lines of some of the houses in the Zoological Gardens. Along each side of the house there are cages occupied at night or in inclement weather. Each cage opens into an outdoor run, which affords plenty of room for exercise. Inside the house and above the cages there are broad shelves for aquaria, and as the windows are at the back of the shelves the creatures in the water can be seen very plainly.

Rustic Woodwork

is very charming in the garden. Arches of different types may be made to accommodate climbing plants. In order



PLAN OF FRAME LIGHT.

Mortice and tenon joints at A. Bottom rail recessed to take sash bars at B.

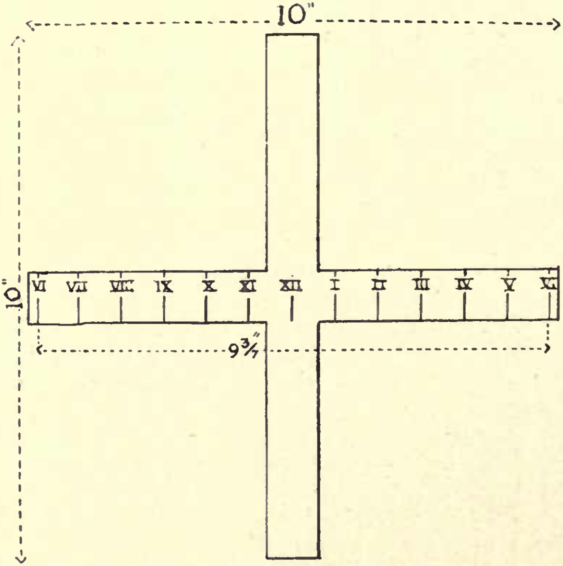
to drive poles into the ground a beetle is used. This resembles a mallet, but is very much larger. The head consists of a log of hard wood (oak or beech) 9 in. long and 6 in. in diameter. A hole is bored to receive the handle, which should be from 2½ to 3 ft. long.

The method adopted in the woodwork teaching consists, first of all, in the formation of a carpenters' guild. A brief chat takes place on the utility of the piece of work to be entered upon. The members are supplied with paper and pencil, and asked to draw rough sketches embodying their own ideas on the subject. A discussion concerning these sketches follows, the teacher makes further suggestions, and from these plans are made which may be regarded as the co-operative work of the class. Careful drawings for reference as the work proceeds are made by each boy. The teacher acts as foreman—he has to distribute the work according to the ability of the boys, to keep all busy, and to give a little help here and there. When one part of the work is of unusual difficulty or when a rather serious mistake has been made, the whole class is brought together for a demonstration on the subject.

METAL WORK.

A considerable variety in the forms of metal work may be attempted with very little equipment. These include metal modelling, bent-iron work, simple tinsmith's work, sheet brass work, and even something of blacksmith's work. There may be a definite course of lessons in metal modelling and bent-iron work, the other forms of metal work being taken incidentally as occasion requires. For instance, when fitting doors to cages for pets, the boys might very well cut hooks for the fasteners out of sheet brass. A hammer and a cold chisel are used for the purpose. The hooks are then filed up and holes are bored to receive the screws.

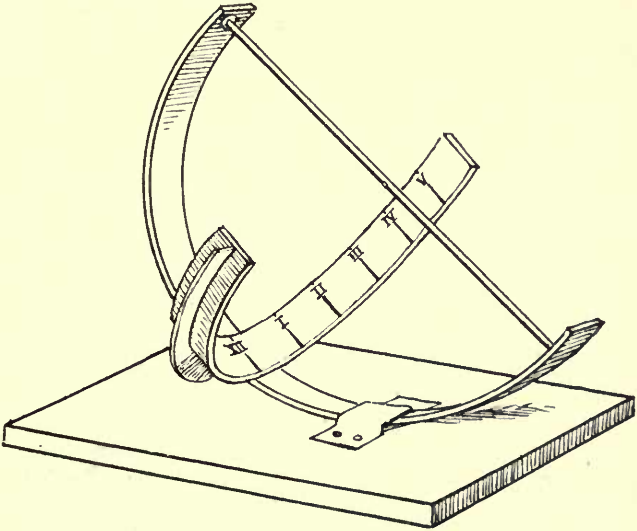
A sundial is a useful appliance which may be made by a couple of the bigger boys. Proceed as follows: From a piece of sheet brass cut out a cross of the dimensions given in the diagram. The strips are presently to be bent into semicircular shape, each with a diameter of 6 in.; the circumference of each semicircle must therefore be $6 \times 3\frac{1}{7} \div 2 = 9\frac{3}{7}$ in. The distance between the extreme marks on the horizontal strip is divided into twelve equal parts and marked for the hours. Roman numerals should be used, as they can be scratched with a file. Holes are bored at the marks on the vertical strip to receive a piece of thin brass rod. If the diameter of the rod is $\frac{3}{16}$ in., it may be filed down at each end to $\frac{1}{8}$ in.; then, if the holes are $\frac{1}{8}$ in. in diameter, the ends of the rod may easily be riveted over.



SUNDIAL: PRELIMINARY BRASS CROSS.

The next step is to bend the strips into shape. Brass varies in hardness according to its composition, but it may be made softer (more pliable) by annealing. This consists in heating it to redness, and plunging it into cold water. The strips should be shaped by bending them round a semicircular piece of wood, and the process may be expedited by the use of a mallet. This completed, the piece of rod should be fixed in the holes of the vertical semicircle.

The horizontal semicircle may be strengthened by soldering on another of the same size, but in a plane at right angles to the first. This part of the work is rather difficult, and may be omitted if the sundial is going to be protected from rough usage.



A SUNDIAL.

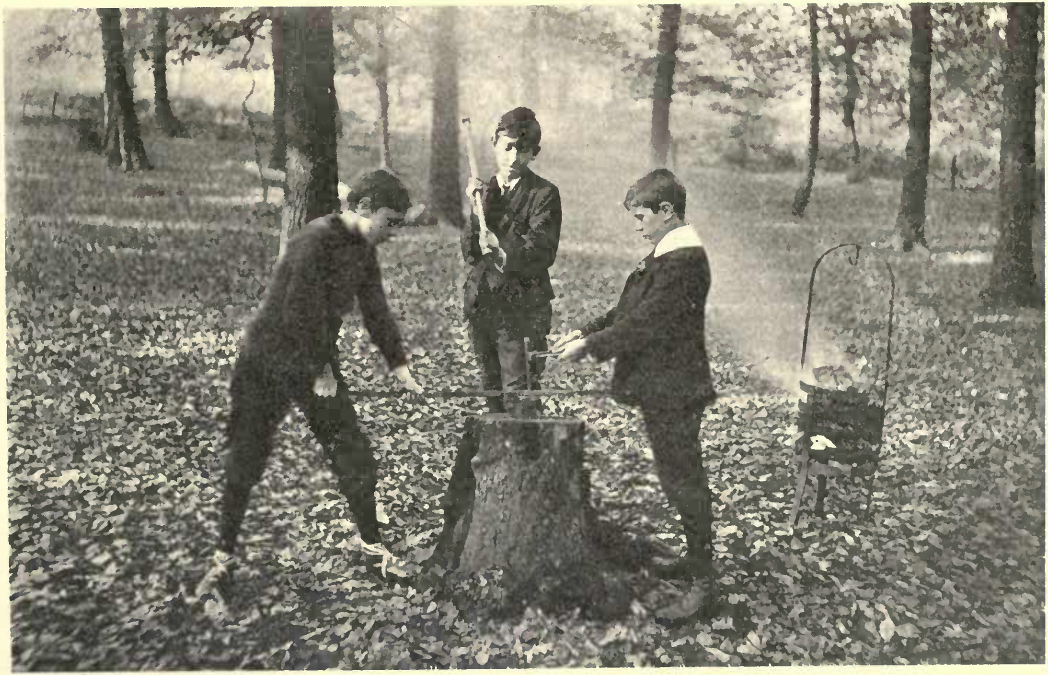
There only remains to place the sundial in position; it must, of course, face due south, and may be fixed to a vertical surface such as a wall—or to a horizontal surface such as a pedestal. It is only necessary to see that the brass rod is at an angle with the horizon equal to the latitude of the place.

A drain-pipe stood up on end makes a good pedestal. Better still, one may model a pedestal in clay from which a plaster mould may be made. The mould should be filled with cement, and so an artistic and permanent shape is the result, in keeping with the sun-dial which is to surmount it.

An illustration is given of a woodland smithy. It shows boys cutting off a length from a piece of iron fencing. The piece cut off was heated again, and the ends were flattened and bent at right angles, in order to make a bar for the fireplace of the kiln described in the chapter on "Clay Modelling." (*See* pp. 173-7.) Notice the primitive forge and anvil; notice, too, the woodman's axe used instead of a sledge-hammer. It is good to work on the scout principle—to make use of what you can find, failing the proper tools for accomplishing your object.

Metal modelling is a simple form of repoussé work. Thin foil of copper, brass, or pewter, is used. Copper is most easily worked, and, for the purpose, Lattin Copper Foil, ·004 in. in thickness, should be obtained. One pound of such foil costs 1s. 8d., and lasts a considerable time. Sheets, 6 in. wide, will probably be the most convenient size.

For the first exercise each child will require a piece of copper 2 in. square, a ruler and pencil, a small piece of thick felt to rest the work on, and a bone chaser. The chaser resembles a bone penholder; it is about 6 in. long, with one end pointed and the other flattened. In the centre of the piece of copper a rectangle is drawn 1½ in. long and ¼ in. wide. The copper is so thin that the impression made by the pencil point is clearly seen on the back. The metal is put face-side downwards on the piece of felt, and the rectangle is pressed out with the chaser. The next step is to turn the copper over and work round the rectangle with the chaser, then back again to press the pattern out still further from behind. Proceed in this way until the rectangle is raised sufficiently while the surrounding copper is quite flat, remembering always to rest the work on the hard desk when working on the face side, but resting it on the felt when working on the back.



Photograph by *A. G. Williamson.*

FORGE AND ANVIL WORK. SHAPING A PIECE OF IRON TO FIT THE CLAY-BURNING KILN. A TREE STUMP SERVING AS AN ANVIL.

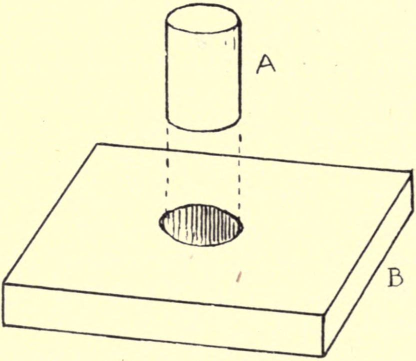
The exercise should be mounted on a small piece of wood, but, before doing so, bend over the edges to make them of double thickness, and fill in the pattern at the back with a cement of some sort. Plaster of Paris will do; sawdust and glue is rather better, as it is not at all brittle. Small brass nails should be used to fix the copper to its wooden mount.

The second exercise is to work out a circular or oval pattern, and the third a letter O or circular ring. By this time the scholars should have mastered the first principles and be ready to launch out a little on their own account. Exercise four might be to work out their own initials. Exercise five to make a leaf pattern. Follow on with flowers and foliage.

When the pattern has been raised in the manner described, it is a good plan to cover the surface of the background with dots. These serve to show up the pattern by contrast. If exposed to the air the surface of the copper soon darkens. When this has taken place, polish and brighten up the raised portions of the metal, and then give it a very thin coat of beeswax and turpentine. The wax will protect the metal from the air, so that the pattern will always appear bright and the background dark.

Metal modelling may be used to embellish the strip woodwork models—letter rack, pen tray, match-box holder, glove box, etc. Photograph frames look well when ornamented with copper. Above all, a finger-plate for the door is a splendid exercise; it affords scope for drawing and design, requires skill in manipulation, and is most effective when complete.

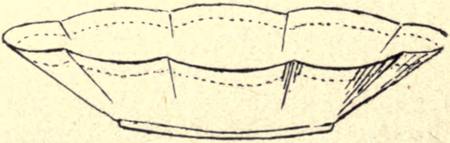
An exercise of rather a different kind is to make a tiny tray suitable for pins or cigar ashes. A hole 1 in. in diameter is bored in a piece of wood, and a small piece of broom-handle, $\frac{7}{8}$ in. in diameter, is also required. A circular piece of copper foil 3 in. in diameter is cut out and a dotted pattern put round the edge. The copper is then rested on the piece of wood so that the hole is under the central portion of the metal. Commence rubbing at that point with the piece of broom-handle so as to force the central portion of the copper into the hole. As this is accomplished the edge of the copper wrinkles up of its own accord, giving quite a pleasing effect to the finished tray.



COPPER PIN-TRAY.

A. A Piece of Broom-handle.
B. A Block of Wood with a Hole in the Centre.

Bent-iron work does not give scope for a great variety in the exercises. It is quickly learned, it is effective, and it affords good opportunities for design. It is very suitable for a short course of lessons, but if continued for a long period it becomes merely mechanical.



THE FINISHED TRAY.

The material required is iron tape of various widths—$\frac{1}{2}$ in. being the most useful. Pliers, both round-nosed and square-nosed, shears, and metal drills must also be included in the outfit.

The following models may be made: brackets of various kinds, a candlestick, an iron stand, a flower-pot stand, a set of hat-pegs.

Finally, all the older boys should have some instruction in tinsmith's work. It may be merely the repairing of water-cans or some of the kitchen utensils as occasion demands.

With two or three soldering irons, some files, a rod of solder, and a sheet each of zinc and tinned iron, a good deal of work can be done. Special gas stoves may be obtained for heating soldering irons, but failing one of these one may use the travelling tinker's method, and have a coke fire in the open air

CHAPTER VI.

Clay Modelling.

In many schools Plasticine has largely taken the place of clay, because it is much less trouble and far cleaner to use. Plasticine may be regarded as the ideal modelling medium for the large classes which, even now, are so usual in town schools. On the other hand, finer results may be obtained by the use of clay: the models are more permanent, and as clay is so cheap it is not necessary to destroy nicely finished exercises in order to use the material over again for new models.

White modelling clay, commercially known as "common cane-coloured body," is the material in general use, but coloured clays can be obtained in most parts of this country. Brown clay is the most common form, and very little preparation is necessary to make it as suitable as "common C.C. body." When dug from the ground, lumps of clay should be put into a convenient receptacle, such as a bath, and covered with water. After two or three days this mixture should be stirred up and passed through a very fine sieve. This clears the clay of pebbles, etc. Allow the mixture to stand for some days until the clay has settled, then pour the water off. The next stage takes a long time, for the clay should be exposed to the weather for the whole of the winter. In the springtime, mix the clay with a little fine sand—this is known as "tempering"—and it is ready for use when a piece, having been squeezed in the hand, does not stick to the fingers.

When clay has been allowed to get too dry and hard, it should be soaked in water for two or three days. The water should be poured off and the clay put upon a board to drain and dry until it is in the right condition.

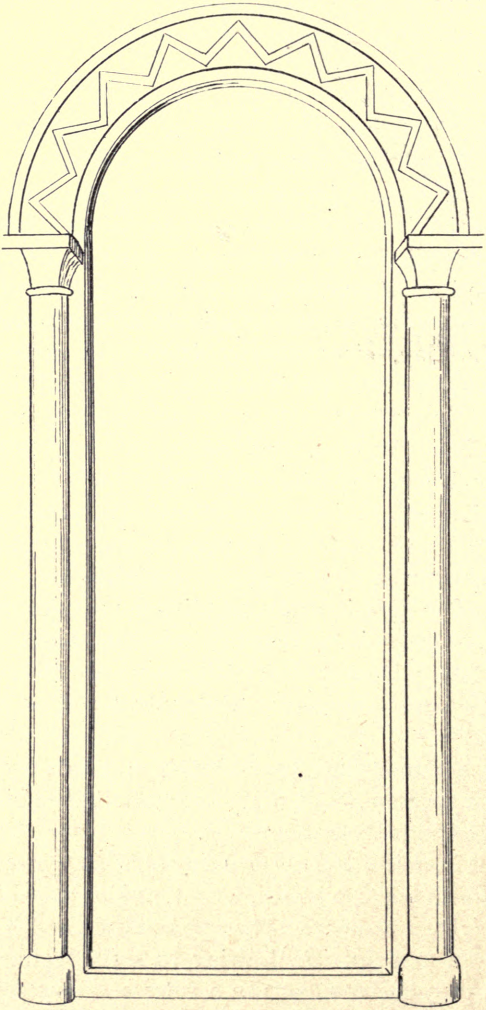
The best method of cutting clay into small pieces for class use is by means of a piece of wire having a wooden handle at each end.

Before starting a model, the clay should be well kneaded, either with the fingers, or, in the case of large pieces, by the method of " wedging." Such a piece should be knocked on the bench into a rough brick-shape, then with the wire a wedge-shaped portion is cut off from one end. This portion should be raised above the head and brought down smartly and with some force into the larger portion. Repeat this some ten or twelve times. By this means minute air-bubbles are driven out of the clay, air-bubbles which would probably cause destruction when the model was nearing completion. If the models are to be fired, very great care must be taken in the preparation of the clay, especially as a school kiln will be a very small one, requiring only five or six hours for firing, whereas the commercial kilns are fired for forty-eight hours. In the latter case, the rise of temperature is so gradual that the risk of breakage is brought to a minimum.

Clay may be kept in good condition for an indefinite period in a sanitary dust-bin. One or two wooden battens should be placed in the bottom in order to prevent the lowest layer of clay from lying in the water. Cover the top layer with damp flannel.

During the modelling lessons have a number of pails of water with sponges about the class, so that the children may wash their hands when necessary.

The first exercises will be very simple, such as the modelling of a potato, an apple, a lemon, a boot, a shoe, a shell, a helmet, a 2-lb. weight, a padlock. Then proceed to models involving careful measurement. A drawing to scale should be made first, and the scholar must use a ruler at every stage of the work. Flat models, such as a biscuit, a rosette, a finger-plate, shields of various patterns, conventional forms made up into



A NORMAN WINDOW.

border patterns, are most suitable as a beginning for this exact work. Proceed to exercises in round relief, such as a flower-pot, a basin, a vase. For this purpose roll the clay into long thin pieces resembling rope. Work these pieces into close coils—a flat coil for the base of the pot, then start building up the sides, still coiling the clay. When the required shape has been obtained, carefully smooth over the surface both inside and outside of the pot. This is the primitive method of making pottery, used in this country before the introduction of the potter's wheel.

The historical idea may be followed up by making models of a British quern, stone spear-heads and axe-heads, a Roman shield and helmet, a Roman gateway, a Saxon drinking horn, a Danish galley, a Danish helmet, ancient stocks ; and, finally, by a series of models to illustrate the History of Architecture in this country.

1. A typical Norman window—a one-light window with circular arch, zigzag moulding, and plain capitals to the pillars.

2. Transition Norman—a two-light window divided by a small pier with arched columns rising from the capital, whose intersections with the sides of the round arch may have suggested the pointed arch, the characteristic of the next style.

3. Early English. The windows are mostly single and narrow, but the peculiarity is the introduction of the pointed arch in the lancet form.

4. Transition Early English. The lancets are grouped, with pierced spandrels, and the group is enclosed by a common projecting moulding.

5. The Decorated Style. Distinguished by its window tracery. (Perhaps better distinguished by its ornamented buttresses.)

6. The Perpendicular Style, which receives its name

from the arrangement of the tracery, which consists of perpendicular lines.

Casting and Pressing.

This is a simple method of making pottery which results in a better finish than is possible when only the fingers and a wooden tool are used. A plaster-of-Paris mould is used to give the required shape. A pattern from which to work will be required. Take, for example, a basin. The basin is inverted on a board, and 1 in. away all round a clay wall is built to a height of 1 in. above the basin. Fill up with plaster and allow to set. When the mould feels warm to the touch (the effect of the lime), remove the clay walls, turn the mould right way up, place the hands inside the basin, and remove it by a screwing motion. If it sticks, soak the plaster with water and try again ; it should now come away easily. Line the mould with well-kneaded clay, taking care that it is of even thickness, and that the separate pieces used are well joined, then stand on one side for a day or two to dry. In a short time the clay will have contracted sufficiently to be taken out of the mould quite easily.

The next step is the ornamentation of the basin ; this may be done by scratching a pattern on with a sharpened piece of wood, or very good effects may be obtained by pressing on to it leaves, lace, or embroidery.

When dry, stand the basin on a piece of glass-paper and rub gently to " true " the base, so that the basin will stand upright and firm. Glass-paper all marks and scratches and round all the edges ; finish by wiping over with a damp sponge. When quite dry again the basin may be varnished, or painted and varnished, but if it is to be really permanent it must be fired.

Up to this stage the class may work in threes or fours, these sharing in the making of the mould, then each making a vessel from it in turn.

The making of tiles may be tackled in somewhat similar fashion. Instead of a plaster mould one of wood may be used; four pieces of wood, united by half-lap joints, make a sort of Oxford picture-frame. The size of the frame will depend upon the size of the tiles, but allowance must be made for contraction during drying—this shrinkage amounts to $\frac{3}{8}$ in. to the foot for white, and $\frac{3}{4}$ in. for common brown clay.

The frame is rested on a piece of wood, then filled in with clay. As it dries the tile will readily come away from the frame. The pattern on the tile may be made by the methods suggested above for a basin; the following methods also are both very effective.

1. *Inlaying.* Make the tile of brown clay, cut out a pattern with a knife, and fill in with white clay.

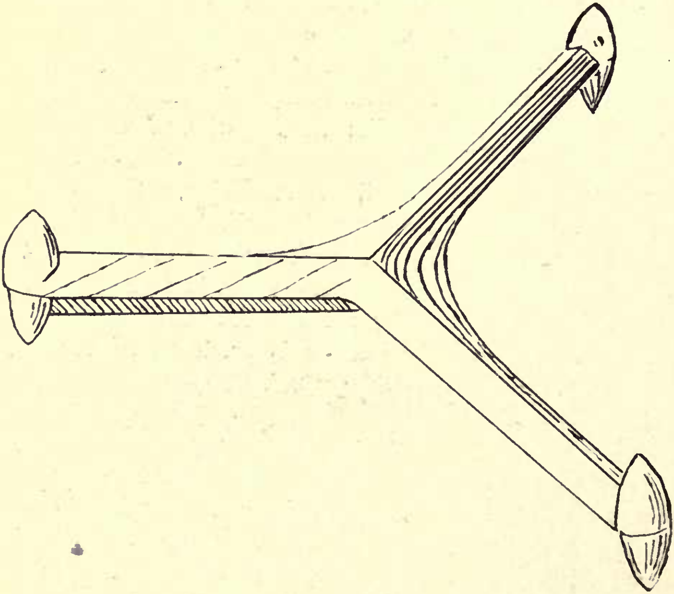
2. *Sgraffito Decoration.* Make the tile of brown clay, then cover with a thin layer of very wet white clay (the form technically known as *slip;* it is so wet as to resemble paste). When almost hard the pattern is produced by scratching through the slip to the dark ground.

FIRING THE CLAY.

When clay is heated to redness, the "combined water" is driven off from it, and its plasticity can never be recovered. Care must be taken, however, that the temperature is raised very gradually and afterwards lowered very gradually, or our clay shapes will fly to pieces.

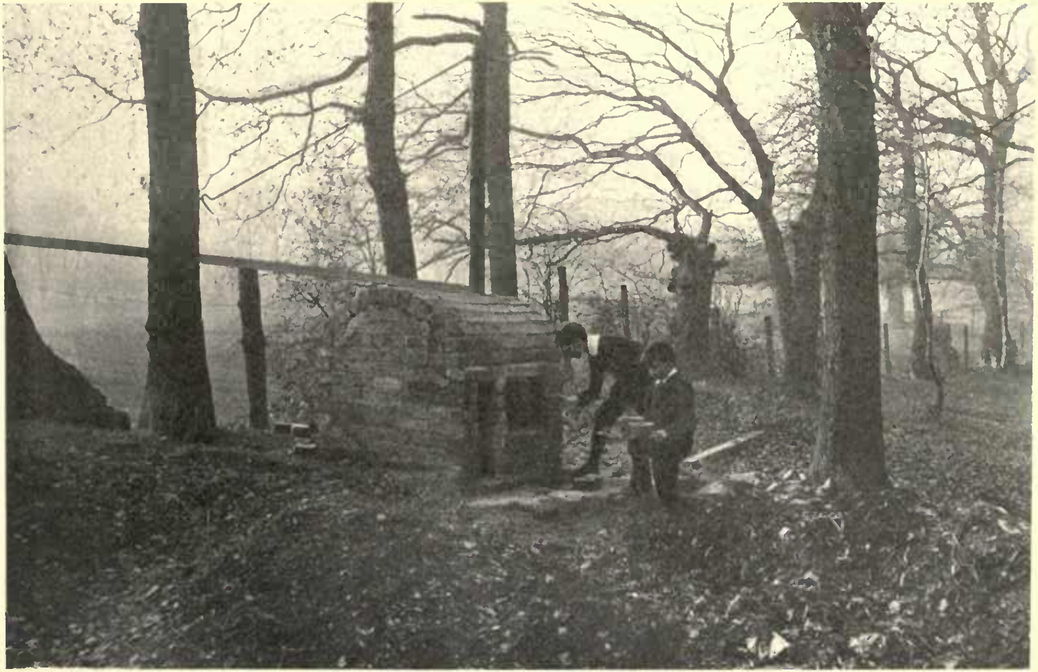
A gas muffle kiln is very convenient, but is expensive to purchase, and rather expensive to maintain. For Open Air School work an outdoor oven may be built which will answer the purpose. It should be built of fire-brick and fire-clay. My own kiln is built somewhat on the pattern of a kitchen range—there is a fire-place and oven, and the flue is over the oven on the side farthest from the fire. The smoke and flames pass across the upper part of the oven on the way to the flue, so that, after the fire has been alight for some time and the pottery is fairly hot, it is possible to add more fuel, so that all the pots in the upper part of the oven are enveloped in flame.

Common brown clay fires at a temperature between 800° and 900° C., and changes to a beautiful red colour. White clay requires a temperature of 1,100° C. to fire it effectually, but at a much lower temperature it is hardened sufficiently for all ordinary purposes.



A STILT.

The kiln will be managed more easily if it has double walls—a higher temperature may be reached and the cooling will be more gradual. The outer wall may be of ordinary house bricks set with mortar, and there should be an air space



Photograph by *A. G. Williamson.*

CHARGING THE POTTERY KILN.

1 in. wide between the two walls. Avoid the use of cement in kiln work, as it will not stand heat, and another precaution is to mix fire-clay twenty-four hours before using it, or it is liable to crack. The great difficulty of amateurs is to put the roof on the kiln. It has to be of fire-brick, and therefore must be arched. Proceed as follows: make a semicircular top to the end walls, then lay wood across to support the bricks until the clay has set. Use "splayed" or "key" bricks for the arch; they are wedge-shaped, and so fit together with a smaller quantity of fire-clay. When the arch is complete, leave it a day or two to dry; then light a fire inside to burn away the wooden supports and finally set the fire-clay.

A SADDLE.

When the pottery has undergone this first firing, it is known as "biscuit" ware. It may be regarded as finished, or it may be further decorated. In most cases scholars are not content to leave it thus, but wish to proceed with the use of colours.

Before colouring, the ware must receive a coat of gum, or the paint will run. Ordinary water colours or oil colours may be used, and a coat of varnish will complete the work. A better method is to use underglaze colours, which are applied mixed with fat oil, or fat oil of turpentine. These colours are mostly metallic oxides, but it must be remembered that their true colours appear only after glazing and firing—a black or brown pigment may be blue after firing, a yellow pigment may turn red, and so on.

When the painting is finished heat the ware in the kiln sufficiently to burn off the oil and gum ; it will now be ready for glazing. Lead glaze, No. 467, fires at 800° C., and is the easiest to use. It should be mixed with water to the consistency of milk. In commerce the pottery is dipped in the glaze, but, as a large quantity of glaze is required for this, it is better for our purpose to use a smaller quantity and spray it on. When dry, handle the ware very carefully or the glaze will come off. Place in the kiln, and this time cover with a larger vessel (a flower-pot will do) to protect from smoke and dust. Raise the temperature very gradually during from two to four hours (according to size of kiln), then allow to cool. During glazing the ware must stand on stilts or saddles, and two shapes must not be allowed to touch or they will be permanently united.

CHAPTER VII.

Other Subjects.

SUBJECTS which are peculiarly suitable for outdoor lessons, and those which lend themselves to modification to make them suitable, have been dealt with at some length. We come now to those subjects, where the methods adopted will be largely the same as in indoor schools.

Reference to these subjects is made for two reasons—

1. Slight modifications are made in the Open Air School. For instance, such reading books as deal with open air life are preferred above all others. The same principle applies also to composition, poetry, and singing.

2. To emphasize the importance of these subjects. So many people regard the Open Air School as a play centre, forgetting that all the subjects of the ordinary school curriculum are taught, and that progress is made at any rate equal to that of indoor schools.

Although subjects mentioned in this chapter are only referred to briefly, it is not because they are regarded as unimportant, but because the methods adopted are familiar to all teachers. A reference to the suggested time-table will show that literature, composition, needlework, weaving, singing have each a very fair share of time allotted to them.

RECITATION.

The following poems are suitable for study and repetition—

Song from "Pippa Passes" (*Browning*);
The Tree in Winter; Little by Little;
Under the Greenwood Tree (*Shakespeare*);
Baby Seed Song (*Nesbit*);
The Rabbits (*Thomson*);
Selections from "Hiawatha" (*Longfellow*);

The Rainbow Fairies (*Hadley*) ;
The Daisies (*Sharman*) ;
A Wish (*Rogers*) ;
To a Butterfly (*Wordsworth*) ;
Reverie of Poor Susan (*Wordsworth*) ;
The Passing of Arthur (*Tennyson*) ;
Fidelity (*Wordsworth*) ;
Home Thoughts from Abroad (*Browning*).

READING.

Some simple books dealing with outdoor life are as follows—

Robinson Crusoe (Defoe) ;
Children of the New Forest (Marryat) ;
Treasure Island (Stevenson) ;
Hereward the Wake (Kingsley) ;
Tales of the Court of King Arthur ;
Stories of Robin Hood ;
Coral Island (Ballantyne) ;
Dent's Nature Books (Westell and Turner).

See also the list of suggestive books on pp. 186-7.

ENGLISH COMPOSITION.

The lessons should include sufficient grammar to ensure correct speech and to enable children to point out errors and describe them correctly. Oral composition should include the telling, and in some cases the acting of simple stories. Some of the old Nature myths are excellent for oral composition.

The written composition should deal largely with outdoor subjects, such as the substance of the Nature lessons. Dictation exercises should not be ignored.

MUSIC.

Two syllabuses are given, suitable for the upper standards and the lower standards respectively.

Upper Class.

1. Breathing exercises.
2. Voice training. Exercises to *oo, oh, ah, ay, ee.*
3. Ear training. Simple phrases consisting of four notes, time and tune combined.
4. Sight reading—
    (*a*) Tonic Sol-fa—time and tune combined.
    (*b*) Staff—easy passages in keys C, F, G, in $\frac{2}{4}$, $\frac{3}{4}$, and $\frac{4}{4}$ time.
5. The Modulator—the first flat and sharp keys.
6. Songs—(*a*) Who is Sylvia ?
    (*b*) I know a Bank ;
    (*c*) Oh, Mistress Mine ;
    (*d*) On Wings of Song ;
    (*e*) The Ash Grove ;
    (*f*) Spring Song ;
    (*g*) Ye Banks and Braes.

Lower Class.

1. Breathing exercises.
2. Voice training. Exercises to *oo, oh, ah, ay, ee.*
3. Ear training. Simple phrases consisting of three notes.
4. Sight reading—
    (*a*) Tonic Sol-fa—time and tune combined.
    (*b*) Staff—easy passages in Key C in $\frac{2}{4}$, $\frac{3}{4}$, and $\frac{4}{4}$.
5. Songs—(*a*) Who is Sylvia ?
    (*b*) R. L. Stevenson's "Songs for Little Children."

DRAWING.

Drawing is such an excellent method of expression that it takes an important place in the curriculum of nearly every school. In estimating its degree of importance, and therefore the time to be allotted to it, we may be guided by making a comparison between drawing and language. They have the same purpose, they are equally useful. A child's power of expression is limited by his appreciation of what he sees, and this is equally true for all methods of expression. The underlying principles in language-teaching and art-teaching are, or should be, identical, and the school time allotted to each should be equal. We may go still further, and insist that, just as in every lesson a teacher by questioning gives opportunities for language training, so in every lesson drawing should play a part. Frequently a child can express his answer to a question by a rapid sketch, but finds it impossible to make himself clear in words ; and this is true of adults, though perhaps not equally so. The fact that well-illustrated books are so much in demand, while books without illustrations go begging, is a proof that in many cases we can read and understand a picture much more easily than we can read and understand a written description. Let us have opportunities for rapid sketching in every lesson, leaving the more careful work for the definite drawing lesson, which shall have for its object the definite training in expression by drawing. One effect of this will be that we shall be unaffected by a brushwork craze, or a chalk-drawing craze, but will use water colour, pencil, crayon, chalk, or even a piece of stick to scratch the surface of the soil, just as we think will be best for the attainment of our purpose.

Let us mention one type of drawing—selecting it not because it is better than others, but because it is a good method much neglected. The sketching is done in pencil—carefully done to show all necessary detail and all tones from the high light to the deep shadow. The drawing is completed by tinting—just flat colour washes, using conventional colours—green for foliage, blue for iron, grey for stone, and so on. It is a simple but very effective method.

NEEDLEWORK.

At the Shooter's Hill Open Air School the girls are divided into two classes for needlework, and the following syllabus is in use.

Lower Section.

1. Various stitches.

2. Making clothes for dolls; patterns of these garments to be taught by means of paper folding, and then cut out in material.

Upper Section.

1. All stitches used in plain needlework.

2. Ornamental stitches—feather-stitching, hem-stitching, smocking and gauging, marking, scallops, blanket stitches, chain stitch, stem stitch, knotting, satin-stitch.

3. Occasional processes, *e.g.*, counter hems, French seam, mantuamaker's hem, overcasting, piping, crossway bands, hooks and eyes, loops, eyelet holes, flannel binding.

4. Darning. For thin places, plain darning, darning a hole —grafting, taking up a ladder, Swiss darning, patching a hole in any woollen garment—jersey, woollen vest, woollen coat, woollen cap.

5. Knitting. Plain and fancy stitches. Knitting stockings, socks, gloves, mittens, cuffs, vests, capes, babies' boots, hug-me-tight.

6. Mending. Generally keeping in repair the school macintoshes and blankets, kitchen linen, boys' and girls' clothing of all kinds.

7. Crochet work of all kinds.

8. Art needlework.

9. Use of sewing machine.

10. Making up of kitchen linen. Cutting out and making up of special drill costumes and costumes for historical scenes.

11. Cutting out and making up of useful garments—blouses, dresses, overalls, pinafores, and underclothing. Patterns

are taught by the following methods: (1) Folding; (2) Scientific measurements; (3) Using a paper pattern from a well-known firm, and altering it to suit the special circumstances.

12. Measuring material required and finding its cost.

WEAVING.

Weaving is a good occupation for the Open Air School, especially for younger children, but it is easily possible to do too much of it.

Plenty of literature is available on the subject, but in making up a course one must guard against mere mechanical repetition. When we see a well-made basket or a beautiful piece of macramé work we admire the skill of the worker, but we admire still more the patience expended in the seemingly endless repetition of one operation.

If weaving is to be well taught, then there must be plenty of variety in the material used, whether cane, raffia, or string; there must be variety in the methods adopted as well as variety in the articles made. This can only be accomplished by taking exercises which may be completed in a comparatively short time.

CHAPTER VIII.

Conclusion.

In the foregoing pages an attempt has been made to show how the Open Air School may succeed in educating certain children who would not stand a chance in any other type of school. Recent developments have shown that Open Air Schools are having a wide sphere of usefulness, and that all classes of children are likely to reap an advantage from them.

Already Education Committees (notably in Monmouthshire) have instructed their architects to prepare plans of school buildings, on Open Air School lines, for normal children—buildings with classrooms somewhat after the style of that at Birmingham, of which an illustration is given.

Two schools of this type have been erected by the Monmouthshire Education Committee, also one for physically defective children by the Bradford Education Committee, and, undoubtedly, the idea will spread.

The Open Air Schools are ushering in a new era as far as education is concerned, and their influence will be felt in all grades from kindergarten to university, and by the healthy as well as by the weak and defective.

SUGGESTIVE BOOKS FOR REFERENCE.

Open Air School Reports.

London. To be obtained of P. S. King & Son, 2 and 4 Great Smith Street, Victoria Street, Westminster, S.W.

1907	Price 1s.	0d.
1908	,,	6d.
1913 (Medical Report only) ..	,,	2d.

Bradford. Report of School Medical Officer for the year ended 31st Dec., 1909. (Apply to Secretary of Education Committee.)

Birmingham. Report of School Medical Officer for the year ended 31st Dec., 1911. (Apply to Secretary of Education Committee.)

Open Air Books.

In the Open Air, by J. Eaton Feasey (Pitman) ;

In the Garden, by J. Eaton Feasey (Pitman) ;

Typical School Journeys, by G. G. Lewis (Pitman) ;

Longer School Journeys, by G. G. Lewis (Pitman) ;

School Gardening, by W. Francis Rankine (Pitman) ;

Garden and Playground Nature Study, by J. Eaton Feasey (Pitman) ;

Farm and Field, by W. Francis Rankine (Pitman) ;

A Scheme of Nature Study and how to Work it, by G. G. Lewis (Pitman).

The Selborne Nature Series.

Fairyland Lane, by Margaret Cameron, L.L.A. ;

Walks and Talks, Wayside and Seaside, Glimpses and Gleanings—all by C. G. Kiddell, B.A., F.L.S. (Pitman).

Handwork Books.

Rural Handicrafts, by G. F. Johnson (Pitman) ;

Paper Cutting for Infants and Juniors, by J. E. Tolson, L.L.A. (Pitman) ;

Busy Work for Nimble Fingers, by Annie Gawthorpe (Pitman);

Suggestive Handwork, by Arthur B. Neal, A.C.P. (Pitman);

Raffia Work, by Alfred H. Bowers (Pitman);

Toy Making, by Bertha Eden (Pitman);

Cane Weaving, by Lucy R. Latter (Pitman);

Clay Modelling for Infants, by F. H. Brown, A.R.C.A. (Pitman);

Clay Modelling for Juniors, by F. H. Brown, A.R.C.A. (Pitman);

Handwork and Needlework, by E. P. Claydon (Pitman);

Introduction to the Art of Basket-making, by T. Okey (Pitman);

Handwork and Arithmetic, I, II, by G. F. Johnson (Pitman);

Paper Cutting and Modelling, Junior Book and Senior Book, by Bernard V. Pring (Pitman);

Handy Book Series: *Needlework; Handy-work; Gardening; Pets; Woodwork* (Nelson);

Effective Paper Cutting, by Anita and Henrietta Waite (Brown & Sons);

Modelling in Cardboard and Leatherette, by C. T. Hammond (Blackie).

Local History and Geography.

Philip's County Readers;

Cambridge County Geographies.

THE END.

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